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by

Martin Baehr and Chris A. M. Reid

Cestode Parasites (Platyhelminthes) of Rodents from New Guinea
and Adjacent Islands with a Redescription of
Paroniella blanchardi (Parona, 1897) (Davaineidae)

by

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190
YEARS
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On a Collection of Carabidae from Timor Leste, with Descriptions of Nine New Species (Insecta: Coleoptera, Carabidae)

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ABSTRACT. The ground beetle (Carabidae) fauna of Timor is reviewed based on recent collecting by the Australian Museum, in Timor Leste. 53 species were collected, of which the following nine species are described as new: *Mecyclothorax timorensis* sp. nov. Baehr; *M. reidi* sp. nov. Baehr; *Rhytisternus externus* sp. nov. Baehr; *Arhytinus timorensis* sp. nov. Baehr; *Notagonum reidi* sp. nov. Baehr; *N. angusticollis* sp. nov. Baehr; *Perigona timorensis* sp. nov. Baehr; *Aristolebia timorensis* sp. nov. Baehr; *Lebia timorensis* sp. nov. Baehr. The new species are compared with their nearest relatives. The remaining material is identified to species, or at least to genus, and discussed according to the current classification of Carabidae. Several species and genera are newly recorded for Timor. In spite of the rather small number of species contained, the sample allows some insight into the relations of the Carabid fauna of Timor to the Oriental and Australopapuan Regions, with about two thirds of the species belonging to the Oriental fauna, and one third to the Australopapuan fauna. A few species also belong to subgroups that are restricted to the southeasternmost Oriental Region “Wallacea”—Sulawesi, and the Maluku, Aru and Kei Islands.

KEYWORDS. Timor Leste; Coleoptera; Carabidae; taxonomy; new species; biogeography; Wallacea

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In this review of Timorese Carabidae, the first author (MB) is responsible for all taxonomic decisions, including authorship of new species, and the second author (CAMR) is responsible for the introductory paragraphs. Both authors collaborated on the concluding biogeographical remarks.

Timor is a long narrow island, 475 km by c. 75 km, separated from both the Australian continental shelf and the remaining islands of the Indo-Malayan archipelago by narrow but deep trenches. Timor is the southernmost island of the biogeographic province of Wallacea. The island is

relatively young, at most 4.5 MY (Nguyen *et al.*, 2013). Like northwestern Australia, Timor has monsoonal rainfall and much of the island is dry for about half of the year. The dominance of limestone and porous soils in the landscape exaggerates this aridity. However, the island is being rapidly upthrust and its scattered massifs exceed 1500 m in several places, rising to 2920 m at Ramelau, near the geographic centre. The mountains have higher rainfall and their runoff produces high energy rivers in the monsoon.

Timor has been inhabited by humans for at least 42,000

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years (Kealy *et al.*, 2015). Much of the landscape is seasonally irrigated, burned or maintained as pasture for horses. There is little natural forest left, with the notable exception of the Nino Konis Santana National Park, at the eastern tip of the island. The vegetation is mostly dry savanna woodland, dominated by eucalypts, fabaceous trees and *Casuarina*. There are numerous streams and rivers but few permanent still-water bodies.

The Australian Museum expeditions to Timor Leste took place in 2011 and 2012, with the purpose of surveying major insect and terrestrial mollusc groups. Each lasted approximately two weeks. The first trip was undertaken at the end of the dry season (early November 2011) and was a scoping survey, involving two Australian Museum staff, coleopterist Chris Reid and malacologist Frank Köhler, a research associate and malacologist Vince Kessner, and a field assistant, Zito Afranio. This party travelled around the territory, along the north coast from Dili to Los Palos, visiting Tutuala and Valu Sere at the eastern tip, then backtracking to Baucau, crossing the island south from there through Loihuno and Viqueque, then following the south coast road to Betano. From Betano the group drove north to Same, then Maubisse, then back to Dili. Kessner and Afranio stayed for an extra week to collect in the Bobonaro area, during which the monsoon broke. In general, collecting on this trip was brief and near the road. Collecting methods were handpicking, sweeping and beating and checking lights around buildings at night. The landscape was mostly extremely dry.

The second trip was undertaken at the end of the wet season (end of May 2012). This part of the Australian Museum expedition involved two teams. One group, lepidopterist David Britton, odonatologist Jacquie Recsei, Köhler, Reid and Afranio, collected in areas of western Timor Leste near Dili, Maubisse, Hatobuilico, Same, Betano, Laclubar and Manatuto. The other group, lepidopterists Andrew Mitchell and Research Associate Jean Weiner, dipterist Dan Bickel, Kessner and local assistant Agivedo Ribeiro, collected in eastern Timor Leste, around Tutuala, Maupitine and Laritame. Collecting on this second trip involved the use of light-, malaise-, yellow-pan traps and pitfalls. Despite limited time and wet weather, members of the expedition were able to ascend the highest mountain, Ramelau, and work further off the road. The landscape was green and relatively lush.

The family Carabidae (Ground beetles) is large and dominated by terrestrial species. They are relatively large-sized and mostly very active beetles, easily trapped in pitfalls or collected flying to light. The Australian Museum survey was not primarily devoted to carabid beetles, yet it collected 53 species which represent an important addition to the knowledge of the carabid fauna of Timor. Few (c. 20) carabid species have been recorded so far from this island, and there have been no other recent serious collections of carabid beetles (MB pers. obs.). The fauna is likely to be much larger than the 65 species listed here. For example more

than half (28) of the 53 species collected in the Australian Museum expeditions are represented by single specimens. Much of the carabid fauna of nearby New Guinea and Australia has been revised by one of us (MB) therefore we are in a position to contextualize the Timorese fauna within this region, although the Oriental fauna to the west is less well known. The carabid fauna provides important biogeographical information about Timor.

Unfortunately not all specimens of the sample could be determined to species, some are determined only to genera. This is largely due to insufficient knowledge of the Carabidae in the southern Oriental Region, particularly of Sulawesi, the Lesser Sunda Islands, and the Moluccas, and the lack of recent revisional work on a number of large genera. As a consequence, in several groups, confident identification is presently impossible without examination of types. Moreover, the first author feels that his lack of familiarity with certain groups might result in unreliable identification.

Material and methods

Measurements were taken using a stereo microscope with an ocular micrometer. Body length was measured from apex of labrum to apex of elytra. Length of pronotum was measured from mid of apex to the most advanced part of base. Length of elytra was measured from the most advanced part of the humerus to the very apex.

In the taxonomic survey standard methods are used. For dissecting the genitalia, the specimens were relaxed overnight in a jar under moist atmosphere, then cleaned for a short while in 10% KOH. The habitus photographs were obtained by a digital camera using ProgRes CapturePro 2.6 and AutoMontage and subsequently were worked with Corel Photo Paint 14.

Most of the material, including all holotypes, is stored in the Australian Museum, Sydney (AMS), but a few paratypes are retained in the working collection (CBM) of the first author (MB) at Zoologische Staatssammlung, München (ZSBS).

Abbreviations

The following abbreviations have been used on labels: @ = at; *b/light* = black light; *comm twr* = communication tower; *euc/s* = eucalypt/s; *E. uro* = *Eucalyptus urophylla* (family Myrtaceae); *gdns* = gardens; *h'way* = highway; *k* = kilometres; *ls* = limestone; *plantn* = plantation; *rf* = rainforest; *sum't plat* = summit plateau; *telcom twr* = telecommunication tower; *t'off* = turnoff; *vacc* = *Vaccinium* [family Ericaceae]; *xing* = crossing. "Site" numbers refer to collecting events by CAMR on the first expedition. TL code numbers refer to collecting events on the second expedition; K numbers are Australian Museum registration numbers (to be de-accessioned when in CBM). The arc-degree symbol is, on some labels, a colon.

Taxonomy

As it is not the task of this paper to discuss in length the justification and hierarchy of any suprageneric categories, the species are arranged in tribal sequence. More extensive discussions about the suprageneric classifications are presented only for the new species.

Carabinae

No carabine species were collected on the expeditions but one species has been recorded.

Calosoma timorense Chaudoir, 1869 (Timor): not collected.

Cicindelinae

No cicindelinae carabids were seen on the expeditions but four species have previously been recorded:

Cicindela divina Horn, 1893 (Timor): not collected.

Cicindela ehlersi Horn, 1914 (Timor): not collected.

Cicindela timoriensis Jordan, 1894 (Timor): not collected.

Collyris viridula Chaudoir, 1865 (Timor): not collected.

Scaritinae

Tribe Clivinini

Only one species of the genus *Clivina* Latreille, 1802 (*s. l.*) has previously been recorded from Timor. The number of species could be considerably raised by appropriate sampling methods, because the *Clivina* faunas of neighbouring New Guinea and particularly that of northern Australia are very numerous in terms of species (Darlington, 1962; Baehr, 2008, 2015b).

Clivina bullata Andrewes, 1927 (Timor): not collected.

Clivina fessa Darlington, 1962.—4 “gorge 1k NE Laclubar 8°44'47"S 125°54'54"E. *uro* / siamweed above gorge, at mv light 1030m 3.vi.2012 C. Reid TL2012/107/598" K402516–617 (AMS); “Hatoudo 8°58'55"S 125°37'27"E, riverine rainforest, 735m 26.v.2012 C. Reid TL2012/088/546 mv light sheet" K402514–515 (AMS). A common and widespread species, recorded from New Guinea, New Britain, and Solomon Islands.

Tribe Scaritini

Scarites timorensis Bänninger, 1949 (Timor): not collected.

Trechinae

Tribe Trechini, subtribe Perileptina

The trechine subtribe Perileptina is distributed in the Palearctic, Afrotropical, Oriental, and Australian regions, with a few species in the Antilles, and *Perileptus* Schaum, 1860 is the most widespread genus. These are tiny, more or less depressed, pilose species which mainly occur in sand and gravel of river banks and shores of lakes and lagoons. In

contrast to the *Perileptus* of Australia, the *Perileptus* fauna of the southern Oriental Region is not well documented, though presently is being worked by the first author (MB).

Perileptus sp.—1 “Kablaki Hotel, Same, 8°59'60"S 125°28'53"E, at mv light opposite field, field 490m 25.v.2012 C. Reid TL2012/082/540" K402694 (AMS). This beetle resembles an undescribed species from Sulawesi.

Tribe Bembidiini, subtribe Tachyina

A very large subtribe distributed worldwide. Species of various genera are common throughout the Oriental and Australopapuan Regions, though most genera are in need of revision, at least in some areas, and the validity of several genera is debatable. Most named species are widespread in the Oriental Region. Most tachyine species live beside water on the banks of rivers, shores of lakes, lagoons, and ponds, some also on beaches.

Elaphropus haliplodes (Bates, 1892).—3 as follows: 1 “Tutuala comm twr, 3k E Tutuala 8°23'57"S 127°17'02"E dry rf on ls c200m TL2012/003/026 yellow pans 25.v.2012" K402645 (AMS); 1 “1k E Mt Acalara, Turiscai Rd 4.5k from h'way 8°49'45"S 125°37'40"E *E.uro* woodland/vacc on ridge 1625m 31.v.2012 C. Reid TL2012/096/764 beating fallen branches" K402643 (AMS); and 1 “1k E Mt Acalara, Turiscai Rd 4.5k from h'way 8°49'45"S 125°37'40"E *E.uro* woodland/vacc on ridge 1625m 31.v.2012 C. Reid TL2012/096/749" K402644 (AMS). A widespread species that occurs through most of southern Asia to northern Australia.

Paratachys fasciatus (Motschulsky, 1851).—13 as follows: 12 “0.4k E Maupitine 8.47319S 127.14378E vine thicket TL2012/001/055 black light bucket trap 24.v.2012" K402648–650, K402652–660 (AMS); 1 “gorge 1k NE Laclubar 8°44'47"S 125°54'54"E *E.uro*/siamweed above gorge at mv light 1030m 3.vi.2012 C. Reid TL2012/107/598" K402651 (AMS). One of the most widespread species in Asia, New Guinea, and Australia. Previously recorded from Timor, as *Tachys trechiformis* (Jordan, 1894).

Paratachys orphninus (Andrewes 1925): 345 (Timor): not collected.

Polyderis sp. cf. *subbrunneus* Darlington, 1962.—1 “nr Desa Liurai, Hatubuilco Rd, 2.5k W t' off highway 8°52'41"S 125°34'36"E sweep E urophylla/vaccinium 24.v.2012 1885m C. Reid TL2012/079/517" K402647 (AMS). The identification is somewhat doubtful, but certainly the specimen is very similar to *P. subbrunneus* which occurs in New Guinea (Darlington, 1962).

Tachyura ceylanica (Nietner, 1858).—1 “Quelica telcom twr @ Mt. Lawaliu 8.58989S 126.55236E mv lamp, 696m 3.vi.2012 TL2012/0177058" K402695 (AMS). A widespread species in the whole Oriental Region.

Tachyura poeciloptera (Bates, 1853).—1 “beach house nr Baucau 8.4428S 126.46906E beach & foreshore mv. bucket trap 10m, 5.vi.2012 TL2012/020/017" K402646 (AMS). A very widespread species throughout South Asia, but probably not in New Guinea.

Tachyura triloris (Andrewes, 1925): 431 (Timor): not collected.

Tribe Moriormorphini, subtribe

Mecyclothoracina

Moriormorphini is one of the largest tribes of subfamily Psydrinae, a polyphyletic group in the traditional sense which has been split up (Baehr, 1999; Bouchard *et al.*, 2011; Liebherr 2011b). Moriormorphini is a diverse group of carabid beetles in terms of morphology and ecology. These beetles live in leaf litter on the ground in lowland and montane forest and on or under bark of various trees in forest, woodland, and even fairly dry country (Baehr, 2003a, 2005, 2007), but also in moss and other epiphytes in rain forest. With respect to subgroups and to morphology, Moriormorphini and other psydrine Carabidae are most diverse in Australia (Moore, 1963; Moore *et al.*, 1987; Baehr, 1999) and many groups are distributed in cool or even cold temperate habitats in Australia, New Zealand, southern South America, and on a number of subantarctic islands. Some groups, however, have invaded tropical, usually montane, regions, for example in North Queensland, New Guinea, and some Pacific islands, where they have undergone remarkable taxonomic radiations (Baehr, 1995a, 1999, 2003a, 2005; Liebherr, 2006, 2008, 2009, 2011a, 2013, 2015; Liebherr & Marris 2008; Moore, 1984; Moore *et al.*, 1987; Perrault, 1978, 1992). Very few species occur in Africa, the southern Oriental Region and the Holarctic Region.

Mecyclothorax Sharp, 1903

Mecyclothorax Sharp, 1903, *Fauna Hawaiiensis* 3: 243, 1901–1910. Type species: *Cyclothorax montivagus* Blackburn, 1878, by subsequent designation (Andrewes, 1939: 135).

Mecyclothorax is the largest genus of the subtribe Mecyclothoracina and is widely distributed in the Australian-Pacific area including Australia, New Guinea, New Caledonia, New Zealand, Society Islands (mainly Tahiti), and Hawaiian Islands, but a few species also are known from Java (Louwerens, 1959) and one even from Mt. Kinabalu in northern Borneo (Baehr & Lorenz, 1999). In terms of species, the Society and Hawaiian Islands are most prolific, which is due to enormous, comparatively recent, taxonomic radiations on both volcanic island groups (Liebherr, 2006, 2008, 2009, 2011b, 2013, 2015; Perrault, 1978, 1992). No species have previously been recorded from Timor.

The specimens of *Mecyclothorax* from Timor were sampled on a single high altitude massif in the western part of Timor Leste by means of pitfall traps and shaking grass tufts over a sheet, in open eucalypt woodland. All specimens were collected above 1800 m.

Mecyclothorax timorensis sp. nov. Baehr

Figs 1, 11, 18

Holotype ♂, “TIMOR LESTE nr Desa Liurai, Hatubuilico Rd, 2.5k W t’off highway 8°52’41”S 125°34’36”E Euc. urophylla/grass/vacc[inium] woodland 24–28.v.2012 1850m J.Recsei TL2012/079/511 [pitfall traps]” K402558 (AMS).

Paratypes (25): 4♂♂, 10♀♀, same data as holotype, K402556, K402560–570 (AMS); K402557, K402559 (CBM); 1♂, 7♀♀, “TIMOR LESTE Ramelau sum’t plat. 8°54’51”S 125°39’31”E 28/05/2012 stunted eucs/vaccinium/moss/grass 2750m C. Reid grass tufting TL2012/090/575” K402543, K402546–547, K402549–552 (AMS), 1♀



Figure 1. *Mecyclothorax timorensis* sp. nov. (body length 4.5 mm).

K402548 (CBM); 2♀♀, “TIMOR LESTE Ramelau 8°54’45”S 125°29’58”E stunted eucs/vaccinium/open grass 2450–2550m 28.v.2012 C.Reid TL2012/091/576” K402545, K402553 (AMS); 1♀, “TIMOR LESTE Hatubuilico Rd 11.5km W t’off h’way 8°53’12”S 125°32’49”E E urophylla/Vacc pasture/gully 2050m 28.v.2012 C.Reid TL2012/080/762” K402554 (AMS).

Etymology. The name refers to the occurrence of this species on the island of Timor.

Diagnosis. Small, unicolourous dark species with short, oval-shaped elytra and wide, cordiform, slightly excised near the base, pronotum. Elytra with two, in some specimens unilaterally three, setiferous punctures. Aedeagus with compressed, remarkably securiform, apex. From *M. reidi* sp. nov. distinguished by fewer elytral setae and the shape of the apex of the aedeagus.

Description. *Measurements.* Length: 4.3–4.9 mm; width: 1.27–1.34 mm; ratios: width/length of pronotum: 1.18–1.23; width base/apex of pronotum: 0.96–1.02; width pronotum/head: 1.36–1.45; length/width of elytra: 1.39–1.43; width elytra/pronotum: 1.53–1.58.

Colour (Fig. 1). Unicolourous very dark piceous to black, the lateral margin of the elytra barely paler. Labrum and mandibles reddish-brown, palpi yellow, 1st–3rd antennomeres and legs pale red, rest of antenna darker, more or less dark piceous. Lower surface more or less piceous, elytral epipleurae pale reddish.

Head (Fig. 1). Rather narrow in relation to prothorax. Eye moderately large, slightly convex, laterad little protruded, orbit fairly large, oblique-convex, c. 1/3 of length of eye. Frontal furrows deep, elongate, oblique, attaining about the middle of the eye, laterally bordered by a narrow ridge. Parafrontal sulcus almost encircling the eye. Frons convex, usually without a median pit. Clypeal suture well impressed. Labrum transverse, truncate, 6-setose. Mandibles moderately elongate, apically suddenly curved. Mentum with distinct, apically rounded tooth. Submentum with very elongate setae. Posterior supraorbital seta situated about at posterior margin of eye but slightly removed mediad. Antenna short, barely attaining the basal angle of the pronotum, median antennomeres little longer than wide. Surface impunctate, with faint, irregular transverse striae, with very faint, superficial, about isodiametric microreticulation, glossy.

Pronotum (Fig. 1). Moderately large, fairly wide but somewhat variable, considerably wider than long, disk fairly convex; lateral margin evenly convex, with a faint excision in front of the basal angle, greatest width slightly in front of middle. Base moderately wide, about as wide as the apex. Apex straight, apical angle slightly projected but rounded. Base slightly convex. Basal angle distinct, about rectangular but slightly differently shaped. Marginal channel narrow, barely widened towards angle. Both apex and base not margined. Anterior transverse sulcus shallow, barely impressed, v-shaped, posterior transverse sulcus deep. Median line well impressed, anteriorly and posteriorly abbreviated. Basal groove short, irregularly circular, fairly deep. Basal area coarsely punctate-corrugate. Anterior marginal seta situated slightly in front of middle, in the marginal channel, posterior marginal seta situated at basal angle. Surface impunctate, on disk with only traces of extremely superficial, slightly transverse microreticulation, lateral parts and basal area more distinctly microreticulate, surface glossy.

Elytra (Fig. 1). Moderately short and wide, dorsally convex, not widened apicad, widest diameter about at middle. Humerus obtusely rounded, lateral margin evenly convex. Basal margin distinct, oblique, slightly sinuate, connected to scutellary stria. Five or even six median striae well impressed and coarsely punctate, slightly abbreviated at base, lateral striae increasingly indistinct; three median striae almost attaining the apex, the external striae increasingly abbreviated in front of the apex. Four or even five median intervals in basal half distinctly convex. Scutellary stria short, deep, situated mediad of the outturned sutural stria. Marginal channel narrow. 3rd interval with two or unilaterally three setiferous punctures attached to the 3rd stria, the anterior puncture situated in basal third, the 2nd puncture at or slightly behind middle, the accidental 3rd puncture situated usually near the posterior third of the elytra. Punctures distinct, setae extremely short. Near apex with a single setiferous puncture at the end of the 3rd stria. Marginal punctures moderately conspicuous, 15–16 in a row that is slightly interrupted in middle, marginal setae elongate if not broken. Intervals impunctate, with faint, more or less

superficial microreticulation consisting of very transverse meshes. Surface fairly glossy, not iridescent. Metathoracic wings absent.

Lower surface. Largely impunctate. Metepisternum slightly longer than wide. Sternum VII in male bisetose, in female quadrisetose.

Legs. Without striking features. Three basal tarsomeres of male anterior tarsus expanded and biserially squamose.

Male genitalia (Fig. 11). Genital ring comparatively narrow and elongate, asymmetric, with narrow base and wide, oblique apex. Aedeagus narrow and elongate, slightly sinuate, lower surface evenly concave. Apex rather compressed, strongly sclerotized, on the upper surface remarkably hooked, and at apical end of orificium on the upper right surface with a small denticle. Orificium situated on the right surface. Internal sac with several sclerotized folds. Left paramere large, wide in basal half, with narrow, elongate, down-curved apex, bisetose at apex and without setae at lower margin. Right paramere narrower, but in basal half wide, likewise with elongate, curved apical part, bisetose at apex and with about 7–8 elongate setae in apical two thirds at lower margin.

Female gonocoxites (Fig. 18). Gonocoxite 1 compact, apical rim with two delicate but rather elongate setae in the lateral part. Gonocoxite 2 rather short, dentiform, slightly curved, with two very stout ventro-lateral ensiform setae; apparently without a narrow dorso-median ensiform seta. Apex with an elongate, subapical nematiform seta that originates from a groove. Apical margin of the lateral plate rather densely setose.

Variation. Some variation is noted in size and relative width of the pronotum, also in distinctness of the lateral elytral striae, and in distinctness of the microreticulation on head, pronotum, and elytra.

Distribution. Western part of Timor Leste, in a restricted montane area, on the highest mountain in Timor (Ramelau) and associated ridges.

Collecting circumstances. Collected on the ground in open eucalypt woodland with grass and *Vaccinium*, between 1850 and 2750 m altitude.

Mecyclothorax reidi sp. nov. Baehr

Figs 2, 12

Holotype ♂, “TIMOR LESTE Ramelau 8°54'28"S 125°30'10"E stunted eucs/vaccinium gully 2300–2400m 28.v.2012 C.Reid TL2012/092/577 grass tufts” K402541 (AMS). **Paratypes** (4): 2♂♂, 1♀, “TIMOR LESTE Ramelau 8°54'45"S 125°29'58"E stunted eucs/vaccinium/open grass 2450–2550m 28.v.2012 C.Reid TL2012/091/576” K402540, K402542 (1♂, 1♀ AMS); K402544 (1♂ CBM); 1♀, “TIMOR LESTE Hatubuilico Rd 11.5km W t'off h'way 8°53'12"S 125°32'49"E E urophylla/Vacc pasture/gully 2050m 28.v.2012 C.Reid TL2012/080/762” K402555 (AMS).

Etymology. The name, proposed by MB, acknowledges coauthor and collaborator Dr Chris Reid, who collected this material.

Diagnosis. Small, unicolourous dark species with short, oval-shaped elytra and wide, cordiform, near base slightly excised pronotum. Elytra with four setiferous punctures. Aedeagus



Figure 2. *Mecyclothorax reidi* sp. nov. (body length 4.7 mm).

with compressed, not securiform apex. From *M. timorensis* distinguished by the larger number of elytral setae and the shape of the apex of the aedeagus.

Description. *Measurements.* Length: 4.4–4.7 mm; width: 1.20–1.33 mm; ratios: width/length of pronotum: 1.21–1.28; width base/apex of pronotum: 1.0–1.04; width pronotum/head: 1.43–1.48; length/width of elytra: 1.40–1.45; width elytra/pronotum: 1.46–1.53.

Colour (Fig. 2). Unicolourous very dark piceous to black, the lateral margin of the elytra barely paler. Labrum and mandibles reddish-brown, palpi yellow, 1st–3rd antennomeres and legs pale red, rest of antenna darker, more or less dark piceous. Lower surface more or less piceous, elytral epipleurae pale reddish.

Head (Fig. 2). Rather narrow in relation to prothorax. Eye moderately large, slightly convex, laterad little protruded, orbit fairly large, oblique-convex, c. 1/3 of length of eye. Frontal furrows deep, elongate, oblique, attaining about the middle of the eye, laterally bordered by a narrow ridge. Parafrontal sulcus almost encircling the eye. Frons convex, usually without a median pit. Clypeal suture well impressed. Labrum transverse, truncate, 6-setose. Mandibles moderately elongate, apically suddenly curved. Mentum with distinct, apically rounded tooth. Submentum with very elongate setae. Posterior supraorbital seta situated about at posterior margin of eye but slightly removed mediad. Antenna short, just surpassing the basal angle of the pronotum, median antennomeres slightly longer than wide. Surface impunctate, with faint, irregular transverse striae, with very faint, superficial, about isodimetric microreticulation, glossy.

Pronotum (Fig. 2). Moderately large, fairly wide but somewhat variable, considerably wider than long, disk fairly convex; lateral margin evenly convex, with a faint excision in front of the basal angle. Widest diameter slightly in front of middle. Base moderately wide, about as wide as the apex. Apex straight, apical angle slightly projected but rounded. Base slightly convex. Basal angle distinct, about rectangular. Marginal channel narrow, barely widened towards angle. Both, apex and base not margined. Anterior transverse sulcus shallow, little impressed, v-shaped, posterior transverse sulcus deep. Median line well impressed, anteriorly and posteriorly abbreviated. Basal groove short, irregularly circular, fairly deep. Basal area coarsely punctate-corrugate. Anterior marginal seta situated slightly in front of middle, in the marginal channel, posterior marginal seta situated at basal angle. Surface impunctate, on disk with only traces of extremely superficial, slightly transverse microreticulation, lateral parts and basal area more distinctly microreticulate, surface glossy.

Elytra (Fig. 2). Moderately short and wide, dorsally convex, not widened apicad, widest diameter about at middle. Humerus obtusely rounded, lateral margin evenly convex. Basal margin distinct, oblique, slightly sinuate, connected to scutellary striae. Five or even six median striae well impressed and very coarsely punctate, slightly abbreviated at base, lateral striae less distinct; three median striae almost attaining the apex, the external striae increasingly abbreviated in front of apex. Five median intervals in basal half distinctly convex. Scutellary stria short, deep, situated mediad of the outturned sutural stria. Marginal channel narrow. 3rd interval with four setiferous punctures attached to the 3rd stria, the anterior puncture situated in basal third, the 2nd puncture about at middle, the 3rd puncture slightly behind middle, and the 4th puncture near the posterior third of the elytra. Punctures distinct, setae extremely short. Near apex with a single setiferous puncture at the end of the 3rd stria. Marginal punctures moderately conspicuous, 15–16 in a row that is slightly interrupted in middle, marginal setae elongate if not broken. Intervals impunctate, with faint, more or less superficial microreticulation consisting of transverse meshes. Surface fairly glossy, not iridescent. Metathoracic wings absent.

Lower surface. Largely impunctate. Metepisternum slightly longer than wide. Sternum VII in male bisetose, in female quadrisetose.

Legs. Without striking features. Three basal tarsomeres of male anterior tarsus expanded and biserially squamose.

Male genitalia (Fig. 12). In shape and structure quite similar to those of *M. timorensis*. Genital ring slightly wider, asymmetric, with narrow base and wide, oblique apex. Aedeagus of same size and general shape, but apex on upper surface only obtusely raised, and the denticle at apex of orificum extremely small or even absent. Orificum and internal sac quite similar. Left paramere slightly shorter and more compact, bisetose at apex, without setae at lower margin. Right paramere also considerably more compact, with a not sclerotized narrow rim along upper border, bisetose at apex and with about 11–12 elongate setae at lower margin.

Female gonocoxites. Similar to those of *M. timorensis* sp. nov.

Variation. Little variation noted.

Distribution. Western part of Timor Leste, on the highest mountain in Timor (Ramelau) and associated ridges.

Collecting circumstances. Collected on the ground in open eucalypt woodland with grass and *Vaccinium*, between 2050 and 2550 m altitude.

Remarks. The two new species described in the present paper are the first records of the genus *Mecyclothorax* from the island of Timor. They partly fill the distribution gap of the genus between northern Australia and New Guinea in the south-east, and Java and Borneo in the north-west.

Apparently both species are closely related, because body shape, structure of the surface, and shape and structure of the aedeagus are very similar. They differ only in the number of tactile elytral setae and in the shape of the apex of the aedeagus. According to the shape of the aedeagus, particularly of the apex, both species seem to belong to the *ambiguus*-group of species which is widely distributed in southern and eastern Australia and in New Zealand. The aedeagus of *M. timorensis* is particularly similar to that of *M. rotundicollis* (White, 1846) from New Zealand. However, body shape, size of the antenna, and surface structure of both species from Timor differ from those of the *ambiguus*-lineage.

Apparently, the species from Timor do not have closely related species in New Guinea, as far as the mecyclothoracine fauna of this island is known, whereas the Oriental species, particularly those from Java, have not been studied recently, so that the structure of their male genitalia is not known in detail. Therefore, the relationships of the species from Timor to species from Java are uncertain.

Because the genus *Mecyclothorax* certainly has originated in Australia, where, in terms of their phylogenetic status, the apparently most plesiotypic species occur, even the few Oriental species are an Australian faunal element.

Thus far, the species are only known from a restricted area in the western part of Timor Leste where they have been sampled in montane areas above 1800 m. At some localities both species have been collected together. Sampling records suggest that both species are ground living and occur in open eucalypt woodland with *Vaccinium*, grass, and moss, where they have been mostly collected from tufts of grass or in pitfall traps. This is also the plesiotypic habitat in Hawaii (Liebherr, 2015).

Harpalinae

Tribe Pterostichini

A very large tribe, the limits of which are still under review. Commonly the tribe, as used in this paper, is subdivided, and some groups such as Cratocerini and Morionini are given the rank of separate tribes.

Caelostomus sp.—1 ex. “Loi Huno 8.77836S 126.37078E pasture/vine thicket 280m TL2012/008/044 black light trap @ hotel 29.v.2012” K402687 (AMS). This large genus is urgently in need of being revised. It is very numerous in the Oriental Region and occurs also on New Guinea and in Australia. Apparently the single specimen is different from all Australian species and the New Guinean species enumerated in Darlington (1962).

Morion gracilis Jordan, 1894 (Timor): not collected.

Morion cf. simulatum Jordan, 1894.—1 ex. “S slope Kablaki NW Same 8°57'44"S 125°36'40"E weedy gdns/coffee/rf trees 970–1020m 26.v.2012 C. Reid TL2012/086/544” K402683 (AMS). The specimen is tentatively referred to the Timorese species *M. simulatum* (Jordan, 1894). Because species of *Morion* are difficult to distinguish and no specimen for comparison was available, the identification is preliminary.

Prosopogmus sp.—7 ex. “c3k W Maubara 8:37'14"S 125:10'45"E at light, clearing in closed forest 60m 20.xi.2011 V. Kessner, C. Afranio TL145/11” K402669 (AMS); “5.8k NE Hato Buliko 8:52'53.8"S 125:34'02.7"E leaf litter, euc woodland 2050 m 1.xii.2011 V. Kessner, Z. Afranio TL188/11” K404670 (AMS); “nr Desa Liurai, Hatubuilico rd, 2.5k W t'off highway 8°52'41"S 125°34'36"E Euc. urophylla/grass/vacc woodland 24–28.v.2012 1850m J.Recsei TL2012/079/511 [pitfall traps]” K402671–673 (AMS); “c8k NE Maubisse 8:49'22"S 125:37'02"E Euc. urophylla & Melastoma woodland 1610m 16.xi.2011 C. Reid Site 46” K404638 (AMS). This predominantly Australian genus urgently needs revision. Besides a few species described from New Guinea, a number of undescribed species are known to occur on that island. The specimens from Timor are undeterminable at present.

Rhytisternus Chaudoir, 1865

Rhytisternus Chaudoir, 1865: Essai sur les Féronides de l'Australie et de la Nouvelle-Zélande: 106. Type species: *Feronia* (*Rhytisterna*) *liopleura* Chaudoir, 1865, by subsequent designation (Britton, 1940).

Diagnosis. Medium-sized to rather large species (in Pterostichini), characterized by bifid mental tooth, transversely striolate proepipleura, absence of the scutellary stria but presence of the scutellary pore on the elytra, usually incomplete striation of the elytra, absence of discal punctures and setae on the 3rd interval, and not transversely sulcate abdominal sterna. The latter character distinguishes the genus from the New Guinean genus *Rhytiferonia* Darlington, 1962, that likewise possesses transversely striolate proepipleura.

The genus *Rhytisternus* presently includes 24 described species that are distributed through the whole of Australia, but have not been recorded elsewhere (Moore *et al.*, 1985, Lorenz, 2005). The genus has not been recently revised, therefore the actual number of species may be considerably larger. Several species of *Rhytisternus* occur in the Northern Territory of Australia opposite the island of Timor. The genus is characterized by presence of several transverse striae on the proepisternum, a character that is similarly present only in the New Guinean genus *Rhytiferonia* Darlington, 1962 which, however, probably is not very closely related to *Rhytisternus* Chaudoir (Darlington, 1962) (see discussion below).

In Australia, most species of *Rhytisternus* have been sampled near water, at river banks and at or near the shores of lakes and lagoons, preferably if these are grown with some vegetation. The single species described in the present paper was collected in dwarf *Eucalyptus* woodland with grass and moss at high altitudes.

Rhytisternus externus sp. nov. Baehr

Figs 3, 13, 19

Holotype ♂, “TIMOR LESTE Ramelau 8°54'45"S 125°29'58"E stunted eucs/Vaccinium/open grass 2450–2550m 28.v.2012 C.Reid TL2012/091/576" K402537 (AMS). **Paratypes** (13): 1♀, same data, K402536 (AMS); 7♂♂, 3♀♀, “TIMOR LESTE Ramelau sum't plat. 8°54'51"S 125°39'31"E 28.v.2012 stunted eucs/Vaccinium/moss/grass 2750m C. Reid grass tufting TL2012/090/575" K402526–528, K402530–531, K402533–535 (6♂♂, 2♀♀, AMS); 1♂, 1♀ K402529, K402532 (CBM); 1♀, “TIMOR LESTE Ramelau 8°54'28"S 125°30'10"E stunted eucs/ Vaccinium/gully 2300–2400m 28.v.2012 C. Reid TL2012/092/582" K402538 (AMS); 1♀, “TIMOR LESTE nr Desa Liurai, Hatubuilico rd, 2.5k W t'off highway 8°52'41"S 125°34'36"E Euc. urophylla/grass/vacc woodland 24–28.v.2012 [pitfall trap] 1850m J.Recsei TL2012/079/511" K402539 (AMS).

Etymology. The name refers to the occurrence of this species outside Australia.

Diagnosis. Moderately large species (in genus), distinguished from the Australian species by the narrow, elongate, slightly ovoid, and dorsally convex elytra, and by the reduction of the posterior wings, also from most species by the complete striation of the elytra.

Description. *Measurements.* Body length: 10.8–12.1 mm; width: 3.65–4.1 mm. Ratios. Width/length of pronotum: 1.16–1.25; width of widest diameter/base of pronotum: 1.29–1.35; width base/apex of pronotum: 0.96–1.0; length/width of elytra: 1.76–1.83.

Colour (Fig. 3). Dark piceous to black, in some specimens scutellum and suture inconspicuously reddish-brown. Labrum and mandibles dark red, palpi and antenna red, apical antennomeres slightly paler. Legs dark red, femora in parts darker. Lower surface very dark piceous to black, but epipleurae of prothorax and of elytra, and the apical margin of the terminal abdominal sternum dark red.

Head (Fig. 3). Narrower than pronotum, dorsally slightly convex. Eye moderately large, laterally little projected, orbit elongate, oblique, more than half as long as the eye. Labrum slightly excised at apex. Mandibles of normal size and shape, near apex incurved. Mentum with a bifid mental tooth, with two elongate setae; submentum also with two very elongate setae. Labium apically widened, bisetose. Palpi of normal size and shape, impilose. Antenna rather short, median antennomeres c. $1.5 \times$ as long as wide, antenna pilose from 4th antennomere. Frontal furrows deep, linear, sinuate, attaining level of anterior third of the eye, ending abruptly. Frons slightly convex, neck with a weak neck constriction. The posterior supraorbital seta inserted slightly posteriad of the eye. Surface with dense but very punctures and only very superficial traces of very fine, about isodiametric microreticulation.

Pronotum (Fig. 3). Slightly wider than long, somewhat cordiform, base as wide as, or slightly narrower than apex; disk dorsally slightly convex. Pronotum widest at, or slightly in front of middle. Apex barely excised, apical angle very slightly projected, but widely rounded. Lateral border evenly convex to base, without any perceptible prebasal sinuation. Base laterally slightly oblique. Basal angle obtusely angulate, c. 110° . Lateral margin narrow throughout. Both, apex and base not margined. Median line deeply impressed, not attaining the apex, but almost



Figure 3. *Rhytisternus externus* sp. nov. (body length 10.8 mm).

attaining the base. Both transverse impressions wide and shallow. Basal grooves deep, linear, almost straight, extended to the basal third of the pronotum. The anterior lateral seta inserted slightly behind the apical fourth of the pronotum, the posterior seta located on the basal angle. Disk in middle with short, extremely superficial transverse striae, with extremely fine, barely perceptible punctures, and very fine, though distinct, isodiametric microreticulation. Surface but moderately glossy.

Elytra (Fig. 3). Narrow and elongate, somewhat ovoid, widened posteriad, widest about at apical third. Dorsal surface moderately convex. Humeral area comparatively narrow, lateral margin in basal half straight but oblique, in apical half evenly convex, but deeply sinuate where the epipleura is crossing the margin. Humerus obtuse or obtusely convex. Apical part convex and slightly incurved towards the suture. All striae distinct and complete, well impressed from base to apex, barely crenulate; intervals distinctly raised, slightly convex. Scutellary striae absent, scutellary puncture and seta present, situated at base of 2nd stria. 3rd interval impunctate. Marginal series composed of 15 punctures which are widely interrupted in middle. At apex of 7th and of 2nd striae with an additional puncture and seta. Intervals impunctate, with very fine though distinct, isodiametric microreticulation; surface but moderately glossy. Metathoracic wings short.

Lower surface. Prosternal process not margined and asetose. Proepisternum with several distinct, transverse sulci, in dorsal part finely punctate. Mesepisternum coarsely punctate. Metepisternum rather short, c. $1.25 \times$ as long as wide at apex, almost impunctate. Abdominal sterna laterally punctuate, but punctures posteriad increasingly finer. Whole abdomen with very fine, isodiametric microreticulation. Terminal sternum in male bisetose, in female quadrisetose.

Legs. Of normal size and shape. 5th tarsomeres with 2–3 elongate setae on either side of the lower surface. 1st–3rd tarsomeres of male protarsus biserially squamose underneath.

Male genitalia (Fig. 13). Genital ring convex, with asymmetric, oblique-convex apex. Aedeagus strongly sclerotized, rather narrow and elongate, about straight, lower surface very concave. Apical part depressed, asymmetric, subapically on the right side deeply concave, at tip irregularly oblique. In apical fifth on the left side dorsally with a denticle that is directed upwards and posteriad, also near the very apex the upper surface on the left side slightly raised. Orificium elongate, situated on the upper surface but slightly moved right. Internal sac without any sclerotized parts, very simply folded. Left paramere short and wide, about quadrangular, at apex almost perpendicular, but at bottom of apw with a short, little sclerotized protuberance. Right paramere narrow, somewhat axe-shaped, with elongate, regularly narrowed apex.

Female gonocoxites (Fig. 19). Gonocoxite 1 elongate, without setae at the apical rim of the ventral surface; gonocoxite 2 curved, with obtusely angulate apex, with one elongate dorso-median ensiform seta below middle, four elongate, rather stout ventro-lateral ensiform setae in the basal half, and two fairly elongate, preapical nematiform setae originating from a large pit. Lateral plate mediat at apex with a few rather stout setae.

Variation. No significant variation noted.

Distribution. Western part of Timor Leste, where it is confined to the highest Timorese mountain (Ramelau) and associated ridges.

Collecting circumstances. Sampled at high altitudes (1850–2750 m) in stunted or tall eucalypt woodland with *Vaccinium*, grass and moss.

Relationships. The new species is tentatively attributed to the Australian genus *Rhytisternus* due to several diagnostic characters, for example, the transverse striolation of the proepisternum, absence of the scutellary stria and of the discal punctures on the elytra, and absence of transverse sulci on the abdominal sterna. Also the male genitalia, aedeagus, parameres, and genital ring, in shape and structure are very similar to those of some Australian species that have been dissected for comparison. However, in body shape, the complete striation of the elytra, and the reduction of the metathoracic wings the species deviates from all described Australian species. Because the genus *Rhytisternus* has not been revised in recent times, the relationships of the new species from Timor with those from Australia presently remain somewhat doubtful.

Remarks. The discovery in Timor of a new species of the Australian genus *Rhytisternus*, or at least of a species closely related to that genus, is not too surprising and corroborates the close relationship of the Carabid fauna of Timor to that of northern Australia. It is already known that species

of otherwise Australian carabid genera occur outside that continent on New Guinea or on islands in the southern part of the Indonesian Archipelago, for example, on Sulawesi, the southern Lesser Sunda Islands, the Moluccas, Aru, Kei, and Tenimber Islands.

However, the habits of the new species are quite different from those of the Australian species of *Rhytisternus*, as far as they have been recorded, because the species from Timor, in contrast to all Australian species, apparently is not decidedly hygrophilous. On the contrary, it has been sampled not only at high altitude, but, even more important, in open eucalypt woodland with grass, and not in the vicinity of open water or of wetlands. The montane habits may have caused the reduction of the flying ability, because wing reduction is very common in montane species, for example, in the New Guinean species of *Rhytiferonia* (Darlington, 1962; Baehr, 2001b).

Darlington (1962) discussed the possible relationship of the New Guinean genus *Rhytiferonia* with the Australian *Rhytisternus*, but denied any close relationships due to the quite different body shape, presence of a transverse sulcus on the abdominal sterna in *Rhytiferonia*, and absence of the scutellary puncture and seta in the New Guinean genus. Presence, or absence, of transversely sulcate abdominal sterna is usually considered phylogenetically important, which *per se* would render close relationship unlikely. But also body shape and habits of the species of *Rhytiferonia* are quite different from those of all species of *Rhytisternus*, because the New Guinean species are bulky, possess reduced wings and no flying ability, and inhabit open woodland and subalpine meadows at high to very high altitude.

The new species from Timor, although agreeing in almost all constitutive character states with *Rhytisternus*, in its montane habits and the loss of flying ability agrees with the New Guinean species of *Rhytiferonia*. Therefore, it may be another, independent descendent from a common origin which is apomorphic, as compared with the species of *Rhytisternus*, in its montane way of life and its loss of ability for flight. There are not enough differences to exclude it from *Rhytisternus*.

Tribe Platynini

A very large tribe with numerous genera worldwide. Unfortunately, the Oriental and Papuan Platynini urgently need revision at generic level, to provide systematic and taxonomic agreement between both faunas. Several of the large genera, in the course of such revisions, may be subdivided, other genera may be united. Some also seem to be genera of convenience that are based on plesiomorphic character states, and these should be critically revised, divided, or united with other genera. To conclude, the subpraspecific systematics of the Oriental-Papuan Platynine fauna presently is a mess.

The number of Platynine species in the Oriental Region and in New Guinea is immense. Whereas the New Guinean fauna is reasonably well recorded, mainly due to the famous work of Darlington (1952), with several additions by Baehr (1992; 1995b; 2000; 2001a; 2001b; 2008b; 2010a; 2010b; 2010c; 2012b), in the Oriental Region the situation is extremely complex and the number of undescribed species is likely to be huge.

In the present paper, genera are used according to their present status, but, for example, *Altagonum* Darlington,

1952, *Colpodes* Macleay, 1825, and *Notagonum* Darlington, 1952, need re-definition.

***Altagonum* sp.**—1 ex. “Mt Laritame 8.69178S 126.38719E water tank, edge moss forest, 1150m TL2012/011/030 yellow pans 30.v.2012” K402601 (AMS). The single specimen is placed with some doubt in the mostly New Guinean genus *Altagonum* Darlington, 1952. However, this is a genus of convenience that, in the course of a revision, may be divided into two or more genera. Many undescribed species are known to occur in New Guinea, a few species also occur on Sulawesi and the Moluccas. The specimen from Timor presently is undeterminable.

Arhytinus Bates, 1889

Arhytinus Bates, 1889: Contributions a la faune Indo-Chinoise. 3^e Mém. Carabidae. *Annales de la Société de France* (6) 9: 278. Type species: *Arhytinus bembidioides* Bates, 1889, by monotypy.

Diagnosis. Medium-sized to very small species (in tribe), characterized by short and wide body shape; absence of the mental tooth; cordiform prothorax; short and wide, oval-shaped and posteriad widened elytra with well impressed and commonly distinctly punctate or crenulate striae and usually rather iridescent surface due to superficial microreticulation of very fine, transverse lines. Commonly the 3rd interval is asetose, rarely unisetose. Even when the external characters are remarkably similar throughout the genus, the male aedeagus is quite differently shaped and structured and may or may not bear a bidentate apex, and commonly it bears one or several strongly sclerotized teeth, or spines, or spinose plates, of different size and shape in the apical part of the (inverted) internal sac.

The genus *Arhytinus* presently includes 50 described species that are distributed from southern India through Nepal, Burma, Thailand, Vietnam, southern and central China, Taiwan, the Philippine and Indonesian Archipelagos including Sulawesi and the Moluccas, to New Guinea and surrounding Islands of the Bismarck Archipelago, but it is not yet known from Australia. The genus has been recently revised (Baehr, 2010a), but since the revision several additional species have been described from various countries (Baehr & Schmidt, 2010; Baehr, 2012a, 2014a,b).

Apart from very few species, specimens of *Arhytinus* are extremely rare in collections, and of many species only the holotype is known, or the species are only recorded from a single locality. The reasons for this apparent rarity are unknown, although they may be rather due to inadequate sampling methods and efforts than to the rarity of specimens in nature. Similarly, of the new species described here, only the holotype is available.

The single species described in the present paper was collected at light in eucalypt forest with weeds near a gorge, at median altitude.

Arhytinus timorensis sp. nov. Baehr

Figs 4, 20

Holotype ♀, “TIMOR LESTE gorge 1k NE Laclubar 8°44'47"S 125°54'54"E *E. uro/siamweed* above gorge, at mv light 1030m 3.vi.2012 C. Reid TL2012/107/598” K402689 (AMS).

Etymology. The name refers to the occurrence of this species on the island of Timor.

Diagnosis. Moderately large species (in genus), distinguished from all species recorded from adjacent areas (eastern Java, Bali, Sulawesi, Moluccas, New Guinea) and of similar body size, except *A. brendelli* Baehr & Schmidt, 2010 from Sulawesi, by decidedly shorter and wider elytra. From the latter species distinguished by slightly larger body size and considerably narrower pronotum with narrower base.

Description. *Measurements.* Body length: 5.5 mm; width: 2.65 mm. Ratios. Width/length of pronotum: 1.52; width of widest diameter/base of pronotum: 1.24; width base/apex of pronotum: 1.06; width pronotum/head: 1.31; length/width of elytra: 1.32.

Colour (Fig. 4). Black, dorsal surface rather iridescent. Lateral margins of pronotum and elytra indistinctly and very narrowly dark red. Labrum and mandibles dark red, palpi and antenna pale red, though 2nd and 3rd antennomeres slightly darker. Femora bright yellow, tibiae and tarsi slightly darker.

Head (Fig. 4). Comparatively large. Eye large, laterally well projected but not semicircular, orbit short, oblique. Frontal furrows shallow, irregularly circular, developed only immediately behind clypeal suture. Antenna moderately elongate, just slightly surpassing the base of the pronotum, 6th antennomere c. 1.5 × as long as wide. Surface with fine, very slightly superficial, isodiametric microreticulation which is weaker towards the neck, rather glossy and iridescent.

Pronotum (Fig. 4). Rather wide, widest slightly in front of middle, dorsal surface rather depressed. Apex fairly deeply excised, apical angles projected but widely rounded. Lateral border evenly convex to close to base, immediately near the basal angle very faintly sinuate. Base rather wide in comparison with diameter, slightly convex. Basal angles obtusely dentate, laterally very faintly projected, c. 120°. Lateral margin anteriorly narrow, in basal fourth widened and deplanate. Apex finely margined, base in middle not margined. Median line shallow but distinct, not attaining apex and base. Both transverse impressions very shallow. Basal grooves wide, shallow. Anterior lateral seta inserted at apical third, slightly in front of widest diameter, and slightly removed from margin. Posterior lateral seta inserted slightly in front of the basal angle. Posterior third of lateral margin and base behind the posterior transverse sulcus with coarse, moderately dense, irregularly spaced punctures. Surface with extremely fine and rather superficial, very transverse microreticulation which is composed of dense transverse meshes and lines, surface glossy and distinctly iridescent.

Elytra. Of average shape, comparatively short and wide, slightly oviform, dorsal surface moderately convex and slightly depressed on disk. Humeral area comparatively wide, lateral margins in basal half but very slightly convex, then evenly convex. Striae deeply impressed, barely crenulate, intervals distinctly raised, convex throughout. 3rd interval impunctate. Only extremely fine and extremely superficial

traces of microreticulation recognizable at very high magnification, composed of finest transverse lines. Surface very glossy, with distinct iridescent lustre.

Lower surface. Prosternal process apparently without seta at apex. Proepisternum with very fine, rather superficial though distinct microreticulation that consists of very transverse meshes, rest of lower surface without perceptible microreticulation. Middle of terminal sternum with very short, erect pilosity. Metepisternum fairly elongate, c. 1.5 × as long as wide at anterior margin. Terminal sternum in female quadrisetose.

Male genitalia. Unknown.

Female gonocoxites (Fig. 20). Gonocoxite 1 short and stout, with 5–6 stout, at apex acute ensiform setae at the apical rim of the ventral surface; gonocoxite 2 curved, with rather acute apex, with one short dorso-median ensiform seta at middle, three elongate, stout ventro-lateral ensiform setae, and a single short preapical nematiform seta originating from a pit. Lateral plate with several small setae at the apical margin.

Variation. Unknown.

Distribution. Western part of Timor Leste. Recorded only from the type locality.

Collecting circumstances. Sampled at light in tall *Eucalyptus* woodland with siamweed, near a gorge, at median altitude.

Relationships. Without knowledge of the male genitalia, relationships in the genus *Arhytinus* are difficult to determine, because of the high grade of similarity in body shape and surface structure in most species. However, in view of body size, overall shape, and length of elytra, the most similar species recorded from surrounding areas seems to be *A. brendelli* Baehr & Schmidt, 2010 from Sulawesi.

Remarks. The new species represents the first record of the genus *Arhytinus* from Timor. However, as explained in the introduction, specimens of *Arhytinus* are so rarely and sporadically sampled that it would be premature to speculate about presence, or absence, of the genus in areas, or on islands, from where it was not yet recorded. Hence, certainly the new species fills a gap in the genus' range, but this is not too surprising.

Although the holotype of the new species is a female, comparisons of body size and shape with all species that occur in surrounding areas clearly demonstrates, that it is different from all described species. Nevertheless, males would be useful to corroborate the taxonomic decision.

It is uncertain whether the apparently very restricted ranges of most species of the genus *Arhytinus* are due to the extremely sparse material and the apparent difficulties in sampling these species, or whether they match the actual distribution patterns. Very few species, particularly those from islands in the Indonesian and Philippine insular belts, have been recorded from more than one locality, or one island. Because most *Arhytinus* species, as far as it has been recorded, have been sampled in more or less dense forest, the ranges indeed may be restricted, because such forest types favor the development of restricted ranges, or, *vice versa*, impede the vagility of those forest species.

Since the holotype is a female, the relationships of the new species so far are uncertain, because the complexly structured and very different male genitalia offer the best tool for species differentiation and probably also for the determination of relationships.



Figure 4. *Arhytinus timorensis* sp. nov., head and prothorax.

Although several species of *Arhytinus* occur in New Guinea and one on each of New Britain and New Ireland, the genus is an Oriental faunal element which is not only demonstrated by its apparent absence from Australia, but, more importantly, because the presumably most basal species, in terms of their phylogenetical status, occur in mainland Asia and in the northern part of the Indonesian Archipelago (Baehr, 2010).

Identification

When using the key to species of *Arhytinus* in Baehr (2012), couplet 27 is easily reached, but must be modified as follows:

- 27 Elytra shorter, ratio length/width 1.32; base of pronotum narrower as compared with apex, ratio base/apex 1.06; also pronotum narrower, ratio width/length 1.52. Timor *A. timorensis* sp. nov.
 — Elytra longer, ratio length/width >1.40; base of pronotum wider as compared with apex, ratio base/apex >1.10; also pronotum usually wider, ratio width/length >1.52, usually much more. Southern India, Sikkim, Burma, Thailand, Vietnam, China, Philippines, Sumatra, Java
 couplet 27 of Baehr's (2012) key.

Although *A. timorensis* keys out with *A. bembidioides* Bates, 1889, *A. indicus* Baehr, 2010, *A. gerdi* Baehr & Schmidt, 2010, and *A. darlingtoni* Baehr, 2012, it is most similar in body shape, particularly in the very short elytra, to *A. brendelli* Baehr & Schmidt, 2010, from Sulawesi. However, this latter species is smaller and has a decidedly wider pronotum.

***Colpodes truncatellus* Fairmaire, 1881.**—25 ex. "Kablaki Hotel, Same 8°59'60"S 125°38'53"E at mv light opposite field

490m 26.v.2012 D. Britton TL2012/082/548" K402572–574, K402588–596 (AMS); "Mt Laritame 8.69178S 126.38719E water tank, edge moss forest, 1150m TL2012/011/030 b/light bucket trap 31.v.2012" K402575, K402577–579, K402586, K402598 (AMS), 1 K402581 (CBM); "Hatoudo 8°58'55"S 125°37'27"E, riverine rainforest, 735m 26.v.2012 C. Reid TL2012/088/546 mv light sheet" K402576 (AMS); "Bobanaro 9°01'47.6"S 125°29'29.1"E at light, hotel balcony 835m 26.xi.2011 V. Kessner, Z. Afranio TL169/11" K402583 (AMS); "c 1k N Maubisse c8:50'00"S 125:35'46"E at light, cafe verandah c.1400m. 30.xi.2011 V. Kessner, Z. Afranio" K402584 (AMS); "Mt Laritame, Water Tank 5; -8.69178S; 126.38719E; 31 May 2012; 1150m; edge of moss forest; D.J.Bickel, A. Mitchell, J.R. Weiner, V.Kessner, A.V.Ribeiro; TL2012/011/016 [black light bucket trap]" K402587 (AMS). *Colpodes* (*s. l.*) Macleay, 1825 is a genus of convenience, that urgently needs a revision, not only at the specific, but also at generic level. In the Oriental Region there is a multitude of undescribed species. *Colpodes truncatellus* (usually under the name *C. habilis* Sloane, 1907) is a common species in New Guinea and surroundings.

***Colpodes obscuritarsis* Chaudoir, 1879.**—3 ex. "Bobanaro 9:01'47.6"S 125:19'29.1"E at light, hotel balcony 835m 28.xi.2011 V. Kessner Z. Afranio TL169/11" K402676 (AMS); "2.7k N Aileu 8°42'28"S 125°33'46"E coffee/Paraserianthes 950m 1.vi.2012 C. Reid TL2012/101/587 sweeping" K402675 (AMS); "1k SSW Maubisse, R. Sara, Same Rd 8°50'25"S 125°35'36"E coffee/casuarina 1360m 1.vi.2012 C. Reid swept LT2012/099/585" K402674 (AMS). A widespread species in the Indonesian Archipelago.

***Colpodes* nr. *saphyrinus* Chaudoir, 1879.**—1 ex. "Mt Laritame 8.69178S 126.38719E water tank, edge moss forest, 1150m TL2012/011/030 b/light bucket trap 31.v.2012" K402600 (AMS). The single specimen is fairly similar to *C. saphyrinus*, a species widely distributed in the Oriental Region. Several similar, apparently undescribed, species are known from the Oriental Region, therefore the determination is doubtful.

***Colpodes* sp. 1**—1 ex. "Mt Laritame 8.69178S 126.38719E water tank, edge moss forest, 1150m TL2012/011/030 yellow pans 30.v.2012" K402599 (AMS). An additional, presently indeterminate, probably undescribed species of the genus *Colpodes s.l.*

***Colpodes* sp. 2**—1 ex. "Bobanaro 9°01'47.6"S 125°19'29.1"E at light, hotel balcony, 835m 26.xi.2011 V. Kessner, Z. Afranio TL169/11" K402585 (AMS). Another indeterminate, probably undescribed species of the genus *Colpodes s.l.*

***Dicranoncus queenslandicus* (Sloane, 1903).**—3 ex. "Mt Laritame 8.69178°S 126.38719°E water tank, edge moss forest, 1150m TL2012/011/016 b/light bucket trap 31.v.2012" K402681–682 (AMS); "Mt Laritame 8.69178°S 126.38719°E water tank, edge moss forest, 1150m TL2012/011/016 mv bucket trap 31.v.2012" K402680 (AMS). This species is newly recorded from Timor and was previously only known from northern Australia.

***Euplynes cyanipennis* Schmidt-Goebel, 1846.**—1 ex. "Hatoudo 8°58'55"S 125°37'27"E, riverine rainforest, 735m 27.v.2012 C. Reid TL2012/088/562" mv lamp, K402677 (AMS). A widespread species in the southern Oriental Region.

***Notagonum* Darlington, 1952**

Notagonum Darlington, 1952: The Carabid Beetles of New Guinea. Part 2. *The Agonini*: 127. Type species: *Notagonum externum* Darlington, 1852, by original designation.

Diagnosis. Medium sized, fully winged, non metallic species with the complete set of setiferous punctures on head, prothorax, and elytra, slightly/weakly excised 4th tarsomere of the metatarsus, and glabrous lower surface of the 5th tarsomeres.

The genus *Notagonum* was founded by Darlington (1952) for a group of platynine species of medium body size and average body shape, that possess all regular setiferous punctures on head, prothorax, and elytra, usually are fully winged, and do not bear any metallic colouration. In its external appearance this genus is similar to the northern genus *Platynus* Bonelli, 1810 (*s.l.*), but is distinguished from most species of *Platynus* by the absence of setae at the lower surface of the 5th tarsomere. Whether the genus *Notagonum* can be maintained in future, has to be checked by a general taxonomic and phylogenetic revision of the Oriental-Papuan Platynini, that, however, would be a major task and probably will not be undertaken in the near future. Some provisional thoughts on the phylogeny at least of the Platynini from Melanesia have been provided by Liebherr (2005).

The genus was founded for two species from New Guinea, but additional species from Australia and the Indonesian and Philippine Archipelagos were either later described, e.g. by Louwerens (1955), or were transferred from other genera, mostly from *Colpodes* Macleay, 1825 *s. l.* (Moore *et al.*, 1987; Lorenz, 2005). In terms of species, the genus is still most numerous in New Guinea (Darlington, 1952; 1971; Baehr, 2010a; 2010b). From Timor so far a single species was recorded, namely *Notagonum pleurale* (Jordan, 1894) that was originally described as a species of *Colpodes*.

As far as their habits have been recorded (see Darlington, 1952), most species of the genus *Notagonum* inhabit more or less wet environments, where some even live on the banks of rivers and creeks. Some species, however, have been collected in leaf litter in more or less closed forest. All species are ground living, and most have been sampled at low to median altitudes, but in New Guinea a few species even occur at rather high altitude. Almost all specimens from Timor likewise were collected in rain or moss forest between 735 and 1250 m, but a single specimen was sampled at 2050 m in a *Eucalyptus urophyllum*-*Vaccinium* pasture gully.

***Notagonum pleurale* (Jordan, 1894: 110)** (Timor): not collected.

***Notagonum reidi* sp. nov. Baehr**

Figs 5, 14, 21

Holotype ♂, "TIMOR LESTE Mt Laritame 8.69178S 126.38719E water tank, edge moss forest, 1150m TL2012/011/016 b/light/bucket trap 31.v.2012" K402620 (AMS).

Paratypes (22): 4 ♂♂ and 7 ♀♀ same data as holotype: K402603, K402609–611, K402613–614, K402617–619 (AMS); 1 ♂, 1 ♀ K402605, K402612 (CBM); 4 ♂♂ and 1 ♀, "TIMOR LESTE Mt Laritame 8.69181S 126.38939E water tank, edge moss forest, 1250m TL2012/012/036 black light/bucket trap 31.v.2012" K402621–625 (AMS); 1 ♀, "TIMOR LESTE Mt Laritame 8.69178S 126.38719E water

tank, edge moss forest, 1150m TL2012/011/030 yellow pans 30.v.2012" K402606 (AMS); 1 ♀, "TIMOR LESTE Mt Laritame 8.69181S 126.38939E water tank, edge moss forest, 1250m TL2012/012/023 yellow pans 31.v.2012" K402607 (AMS); 1 ♀, "TIMOR LESTE Hatubuilico Rd 11.5km W t'off h'way 8°53'12"S 125°32'49"E E urophylla/Vacc pasture/gully 2050m 24–26.v.2012 J.Recsei TL2012/080/? Pitfall" K402626 (AMS); 1 ♂, "TIMOR LESTE Hatoudo 8°58'56"S 125°37'27"E riverine rainforest, 735m 26.v.2012 C. Reid TL2012/088/546 mv light sheet" K402615 (AMS); 1 ♂, "TIMOR LESTE Bobonaro 9:01'47.6"S 125:19'29.1"E at light, hotel balcony 835m 28.xi.2011 V. Kessner Z. Afranio TL169/11" K402604 (AMS); 1 ♂, "TIMOR LESTE Mt Laritame water tank 5; -8.69178S 126.38719E; 31 May 2012; 1150m; edge of moss forest; D.J.Bickel, A.Mitchell, J.B.Weiner, V.Kessner, A.V.Ribeiro, TL2012/011/016 [black light bucket trap]" K402602 (AMS).

Etymology. The name, proposed by MB, acknowledges co-author and collaborator Dr Chris Reid, who prepared this material.

Diagnosis. A medium sized, more or less dark piceous species without distinct spines or denticles at the apex of the elytra; distinguished from *N. pleurale* (Jordan, 1894) by slightly lesser body size, indistinct dark red spots on the frons, impunctate thoracic and abdominal sterna, and almost similarly sized lobes of the 4th tarsomere of the metatarsus; and from *N. angusticollis* sp. nov. by wider pronotum with coarsely punctate lateral part of the base, shorter elytra, shorter antenna, and different structure of the internal sac of the aedeagus.

Description. Measurements. Body length: 7.2–8.4 mm; width: 2.85–3.3 mm; ratios: width/length of pronotum: 1.29–1.32; width widest diameter/base of pronotum: 1.19–1.22; width base/apex of pronotum: 1.23–1.25; width pronotum/head: 1.30–1.35; length/width of elytra: 1.62–1.65; length/width of 6th antennomere: 2.55–2.65.

Colour (Fig. 5). Dark piceous to almost black, lateral margin of the pronotum inconspicuously, but rather widely, more or less pale red, margin of elytra inconspicuously, extremely narrowly dark red. Labrum and mandibles reddish-piceous, palpi and antenna more or less pale red, 1st antennomere at least at the undersurface paler than the rest. Frons with two large though indistinct, more or less dark red spots. Legs dark red to reddish-brown, outer surface of the tibiae slightly darker. Epipleura of prothorax and elytra more or less pale red, lower surface reddish-brown.

Head (Fig. 5). Of average size, dorsal surface moderately convex. Eye large though laterad but moderately protruded; orbit short, oblique, about one third of length of eye. Labrum anteriorly straight; mandibles of normal size and shape; palpi elongate, impilose. Mentum with acute, unidentate tooth and two elongate setae. Submentum quadrisetose. Antenna elongate, median antennomeres slightly $> 2.5 \times$ as long as wide, densely pilose from middle of 4th antennomere. Frons slightly convex, frontal furrows linear, rather shallow, slightly turned outwards. Usually medially of eye with a more or less distinct, shallow, circular groove. Neck with shallow but distinct transverse sulcus. Surface glabrous, without microreticulation except on labrum, with rather sparse, extremely fine punctures that are only visible at very high magnification, very glossy. Only laterad of the frontal furrows surface slightly rugose.



Figure 5. *Notagonum reidi* sp. nov. (body length 7.2 mm).

Pronotum (Fig. 5). Rather wide, widest at or slightly in front of middle, dorsal surface gently convex. Base rather wide, wider than apex. Apex well excised; apical angle protruded and widely rounded at tip; lateral margin in anterior half gently convex, in basal half oblique and straight or but slightly convex, near base faintly sinuate. Base in middle straight, laterally slightly oblique. Basal angle obtusely angulate, c. 100° . Apex and middle of base margined, lateral parts of base barely margined. Lateral margin and channel rather wide and deep, basad widened and explanate. The anterior transverse sulcus fairly deep, narrow, the posterior sulcus wide and shallow; median line distinct, well impressed, almost complete. The anterior marginal seta situated slightly in front of middle, the posterior seta situated at basal angle. Disk with irregularly transverse, superficial striae. The lateral margin in basal half and the lateral parts of the base with coarse, rugose punctures. Disk with extremely fine and sparse punctures barely recognizable even at high magnification, and with very superficial traces of transverse microreticulation, surface very glossy.

Elytra (Fig. 5). Moderately short and wide, slightly widened apicad, widest slightly behind middle, dorsal surface moderately depressed. Humerus wide, slightly produced but widely rounded, lateral margin in basal half almost straight but slightly oblique, in apical half regularly convex, with rather shallow, not angulate excision near apex, margin slightly incurved towards suture and without, or with a faint,

obtuse protuberance at suture. Lateral margin very narrow. Striation complete and well impressed, all striae extended to apex, impunctate. Intervals depressed. The anterior discal puncture situated at basal fourth and attached to the 3rd stria, the median puncture situated slightly behind middle, the third puncture about at apical fifth, both, median and posterior punctures attached to the 2nd stria. Setae fairly elongate. Marginal series consists of 21–22 punctures that are not or barely interrupted in middle. Surface with extremely fine, barely recognizable punctures, without microreticulation or with finest traces of transverse microreticulation, very glossy, slightly iridescent.

Lower surface. Surface, including abdomen, impilose and almost impunctate, except the narrow mesepisternum which is punctate. Surface glossy throughout. Metepisternum elongate, c. twice as long as wide at apex. Terminal sternum in male bisetose, in female quadrisetose.

Legs. Of normal shape and structure. Tarsi sulcate on both sides. 4th tarsomere of metatarsus little excised, the outer lobe little longer than the inner one. 1st–3rd tarsomeres of the male protarsus widened and biserially squamose.

Male genitalia (Fig. 14). Genital ring rather narrow, laterally slightly convex, with moderately wide asymmetric, obtusely convex apex and very narrow base. Aedeagus rather narrow and elongate, straight, depressed, lower surface, apart from near base, almost straight. Apex rather elongate, straight, depressed, regularly triangular. Internal sac with several sinuate, sclerotized rods. Both parameres comparatively short and compact, the right one stouter, with obliquely rounded apex, the left one with obtusely triangular apex.

Female gonocoxites (Fig. 21). Gonocoxite 1 large, with about 8 stout ensiform setae at the apical rim of the ventral surface; gonocoxite 2 comparatively small, slightly curved, with obtusely angulate apex, with one elongate dorso-median ensiform seta above middle, two or three rather stout ventro-lateral ensiform setae in middle, and two short, preapical nematiform setae originating from a pit. Lateral plate along the whole apical margin with many short and rather delicate setae.

Variation. Very little variation noted,

Distribution. Upland areas of Timor Leste, from Bobonaro to Mount Laritame.

Collecting circumstances. Most specimens were collected in or near rain forest and moss forest between 735 and 1250 m, usually at light or in yellow pans, one, however, in an *Eucalyptus urophyllum-Vaccinium* pasture gully at 2050 m.

Notagonum angusticolle sp. nov. Baehr

Figs 6, 7, 15

Holotype ♂, “TIMOR LESTE 7k E Laclubar on Manatuto Rd 8°44'39"S 125°58'29"E grassy bog/stunted E uro[phylla]/Melastoma 1180m 4.vi.2012 C. Reid TL2012/108/600" K402608 (AMS). **Paratype:** 1 ♂, “TIMOR LESTE 2.7k N Aileu 8°47'28"S 125°33'46"E coffee/Paraserianthes 950m 1.vi.2012 C.Reid TL2012/101/587 sweeping" K402616 (CBM).

Etymology. The name refers to the narrow pronotum.

Diagnosis. A medium sized, reddish-piceous species, distinguished from both other species recorded from Timor by the narrow, barely punctate prothorax, the distinct denticle at the apex of the elytra, and a distinct angle at the apex of



Figure 6. *Notagonum angusticolle* sp. nov., head and prothorax.

the 3rd stria; further distinguished from *N. pleurale* (Jordan, 1894), by slightly lesser body size, impunctate thoracic and abdominal sterna, and almost similarly sized lobes of the 4th tarsomere of the metatarsus; and from *N. reidi* sp. nov. by longer elytra, slenderer antenna, and different structure of the internal sac of the aedeagus.

Description. Measurements. Body length: 7.75–7.8 mm; width: 2.95–3.0 mm; ratios: width/length of pronotum: 1.19–1.21; width widest diameter/base of pronotum: 1.17–1.19; width base/apex of pronotum: 1.38–1.39; width pronotum/head: 1.31; length/width of elytra: 1.68–1.72; length/width of 6th antennomere: 3.8–3.9.

Colour (Fig. 6). More or less dark piceous, lateral margins of the pronotum conspicuously and rather widely pale red, margin of elytra not perceptibly paler. Labrum, mandibles, and palpi piceous, antenna piceous, but three basal antennomeres slightly paler than the rest. Frons with two large though indistinct, more or less dark red spots. Legs dark red to piceous, outer surface of the tibiae slightly darker. Epipleura of prothorax and elytra more or less pale red, lower surface reddish-brown.

Head (Fig. 6). Of average size, dorsal surface moderately convex. Eye large, laterad moderately protruded; orbit short, oblique, slightly less than one third of length of eye. Labrum anteriorly straight; mandibles of normal size and shape; palpi elongate, impilose. Mentum with acute, unidentate tooth and two elongate setae. Submentum quadrisetose. Antenna very elongate, median antennomeres almost 4 × as long as wide, densely pilose from middle of 4th antennomere. Frons regularly convex, frontal furrows linear, rather shallow, slightly outturned. Neck with shallow but distinct transverse sulcus. Surface glabrous, without microreticulation except on labrum, without perceptible punctures.

Pronotum (Fig. 6). Comparably narrow, widest at or slightly in front of middle, dorsal surface gently convex. Base rather wide, wider than apex. Apex well excised; apical angle protruded and widely rounded at tip; lateral margin gently convex to base, near base not sinuate. Base in middle straight, laterally rather oblique. Basal angle obtuse, at tip even shortly rounded, c. 110° . Apex and base completely margined. Lateral margin and channel in apical half narrow, but deep, basad widened and explanate. The anterior transverse sulcus rather shallow, narrow, the posterior sulcus deeper; median line distinct, well impressed, almost complete. The anterior marginal seta situated slightly in front of middle, the posterior seta situated very slightly in front of the basal angle. Disk irregularly transverse, with very superficial striae. Lateral margin and base barely punctate. Disk without perceptible microreticulation and apparently impunctate, surface very glossy.

Elytra (Fig. 7). Rather elongate, slightly widened apicad, widest slightly behind middle, dorsal surface moderately depressed. Humerus wide, slightly produced but widely rounded, lateral margin in basal half almost straight but slightly oblique, in apical half regularly convex, with rather shallow, not angulate excision near apex; at level of 3rd stria with an obtuse but distinct, angle, and with a short, distinct sutural denticle. Lateral margin very narrow. Striation complete and well impressed, all striae extended to apex, impunctate. Intervals depressed. The anterior discal puncture situated at basal fourth and attached to the 3rd stria, the median puncture situated about at apical third, the third puncture about at apical sixth, both, median and posterior punctures attached to the 2nd stria. Setae fairly elongate. Marginal series consists of 18 punctures that less dense in middle. Surface with extremely fine traces of very transverse microreticulation, very glossy, slightly iridescent.

Lower surface. Surface, including abdomen, impilose and almost impunctate, except the narrow mesepisternum which is punctate. Surface glossy throughout. Metepisternum elongate, slightly > twice as long as wide at apex. Terminal sternum in male bisetose.

Legs. Of normal shape and structure. Tarsi sulcate on both sides. 4th tarsomere of metatarsus little excised, the outer lobe little longer than the inner one. 1st–3rd tarsomeres of the male protarsus widened and biserially squamose.

Male genitalia (Fig. 15). Genital ring rather narrow, almost parallel-sided, with asymmetric, obtusely triangular apex and very narrow base. Aedeagus rather narrow and elongate, straight, depressed, lower surface, apart from near base, almost straight. Apex rather elongate, straight, depressed, obtusely triangular. Folding of internal sac rather simple, but in middle of bottom with a short, sclerotized piece and another, curved, narrow, sclerotized rod. Both parameres comparatively short and compact, the right stouter, both with obtusely triangular apex.

Female gonocoxites. Unknown.

Variation. Very little variation noted.

Distribution. Upland areas in western part of Timor Leste.

Collecting circumstances. One specimen was collected at 1180 m in a grassy bog beside stunted eucalypt woodland with grass and *Melastoma*, the other was collected at 950 m in a plantation of coffee shaded by *Paraserianthes*, by sweeping.

Remarks. In body shape and colouration both new species are quite similar to the other described Timorese species, *N.*



Figure 7. *Notagonum angusticolle* sp. nov., apex of the elytra.

pleurale. However, both differ in some respects from that species: e.g. in body size and little or not punctate thoracic and abdominal sterna. With respect to the wide and laterally punctate pronotum and the almost unarmed apex of the elytra, *N. reidi* comes closer to *N. pleurale*, whereas *N. angusticolle* is more distinct, mainly in view of the distinctly denticulate elytral apex. Comparison of both new species with almost all described, similarly sized and structured species of the genus from New Guinea and Australia corroborates their taxonomic distinctness. The same applies for those species of *Notagonum* that are recorded from neighboring areas, e.g. Sulawesi, the southern Lesser Sunda Islands, and the Moluccas.

Presumably the genus *Notagonum* is a Papuan, or even an Australian, faunal element, because the few species that occur in Australia lack any special character states that are present in a couple of species in New Guinea: e.g. angulate or spined elytral apex, very narrow body shape, pilose abdominal sterna, small, but laterad markedly protruded eyes, and others. Although in Australia and in large parts of New Guinea *Notagonum* species are lowland dwellers, and many species are widely distributed, the high taxonomic and morphological diversity of the genus in New Guinea may be caused by the remarkably dissected surface of the central part of New Guinea with its very high mountains and deep valleys. Such a landscape strongly supports rapid speciation events.

The species of *Notagonum* on Timor belong to the Papuan-Australian fauna and thus show the close relation of part of the Carabid fauna of Timor to the Australian and Papuan fauna.

Tribe Perigonini

The tribe Perigonini includes small, characteristically shaped Carabid beetles which occur on all continents, but are most common in tropical regions (Csiki, 1931). The mostly small, more or less depressed, *Trechus*- or *Tachys*-like beetles are easily identified by the elongate, conical terminal palpomeres, short frontal furrows, and the wide, depressed, usually pilose apical marginal channel of the elytra. The affinities of the tribe Perigonini are not fully understood, but probably they belong to the lachnophorine-odacanthine lineage (Jeannel, 1948).

The genus *Perigona* Castelnau, 1835 has been divided into several subgenera (see Lorenz, 2005) which some authors consider genera. One of these subgenera is *Trechicus* LeConte, 1853, which is distinguished from *Perigona s. str.* by the subapical marginal setiferous punctures of the elytra forming a triangle instead of a straight line. The nominate subgenus *Perigona* includes about 90 described species which are distributed almost worldwide, while the subgenus *Trechicus* includes about 45 described species most of which occur in the Afrotropical, Oriental, and Papuan-Australian regions, but one of which is a synanthropic species, *Perigona nigriceps* (Dejean, 1831), distributed almost worldwide. However, the number of yet unknown or undescribed species in the genus *Perigona* may be large, because, apart from Basilewsky's (1989) revision of the African Perigonini and Baehr's (2013) revision of a subgroup of *Perigona s. str.* from the Oriental-Pacific region, no recent comprehensive work has been done on the tribe. The keys of Jedlicka (1964) for the East Asian species, of Darlington (1964, 1968) for the Australian and New Guinean species, and of Andrewes (1929) for the Sumatran species are of some use, although they are outdated, and even were incomplete for the then described species. Moreover, these keys, including those of Darlington (1964, 1968), make no use of genitalic characters. However, the male genitalia in most *Perigona* species are complex and thus give an excellent tool for differentiation of the externally usually very similar species. Indeed, certain species are barely distinguishable without consideration of the genitalia.

Most *Perigona* species occur in litter in closed forest; therefore specimens are usually only collected by specialized sampling methods, such as Berlese extraction or sifting ground litter. Most species can fly, so they are also encountered at light and in flight intercept traps. Because such sampling methods have been employed in few areas and moreover, usually rather casually, the taxonomic knowledge of this group is not satisfactory and rather fragmentary.

No species of the genus has previously been recorded from Timor, although *P. nigriceps* would be expected (present in the examined material) and the related *P. litura* (Perroud & Montrouzier, 1864) might also be expected as it is a similarly distributed species.

Perigona Castelnau

Perigona Castelnau, 1835: Études Entomologiques, ou Description d'Insectes Nouveaux et Observations sur leur Synonymie. Première partie: 151. Type species: *Perigona pallida* Castelnau, 1835, by monotypy.

For synonyms and citations see Baehr (2013).

Subgenus *Trechicus* LeConte, 1853

Trechicus LeConte, 1853: Notes on the classification of the Carabidae of the United States: 386. Type species: *Trechicus umbripennis* LeConte, 1853 (= *Bembidion nigriceps* Dejean, 1831 = *Perigona nigriceps*).

Diagnosis. Small, usually rather wide and fairly depressed species, characterized by the subapical marginal setiferous punctures of the elytra which are arranged in a distinct triangle.

***Perigona nigriceps* (Dejean, 1831).**—4 ex. “beach house nr Baucau 8.4428S 126.46906E beach & foreshore mv bucket trap 10m, 5.vi.2012 TL2012/020/017” K402691

(AMS); “c3k W Maubara 8°37'14"S 125°10'45"E at light, clearing in closed forest 60m 20.xi.2011 V. Kessner, Z. Afranio TL145/11” K402690 (AMS); “Loi Huno 8.77836S 126.37078E pasture/vine thicket 280m TL2012/008/044 black light trap @ hotel 29.v.2012” K402692–693 (AMS). A common, synanthropic worldwide species.

Perigona (Trechicus) timorensis sp. nov. Baehr

Figs 8, 16

Holotype ♂, “TIMOR LESTE gorge 1k NE Laclubar 8°44'47"S 125°54'54"E uro/siamweed above gorge, at mv light 1030m 3.vi.2012 C. Reid TL2012/107/598” K402525 (AMS). **Paratypes** (4): 2 ♂♂, 1 ♀, same data as holotype, K402521, K402524 (♂, ♀ AMS), ♂ K402523 (CBM); 1 ♂, “TIMOR LESTE Mt Laritame, 8,69178S 126.38719E water tank, edge moss forest, 1150m TL2012/011/016 mv bucket trap 31.v.2012” K402522 (AMS).

Etymology. The name refers to the occurrence of this species on the island of Timor.

Diagnosis. A medium sized species with wide subapical channel, very wide aedeagus, and a pattern of various narrow, sclerotized rods in the internal sac (Fig. 16); distinguished from most similarly shaped species by combination of wide prothorax with comparatively narrow base, and absence of regularly coiled structures in the internal sac. Further distinguished from the nearest related species *P. punctatostratus* Baehr, 2013 and *P. moluccensis* Baehr, 2013 by pale latero-apical angles of the pronotum, longer elytra, the wide, pale margin of the elytra, greater number of deeply impressed elytral striae, and the different structure of the internal sac of the aedeagus.

Description. Measurements. Body length: 3.65–3.75 mm; width: 1.7–1.75 mm. Ratios. Width/length of pronotum: 1.43–1.48; width of widest diameter/base of pronotum: 1.21–1.24; width apex/base of pronotum: 0.93–0.95; width pronotum/head: 1.25–1.31; length/width of elytra: 1.37–1.40.

Colour (Fig. 8). Black, apical angle of the pronotum widely pale yellow, also the lateral part of the elytra, about from 5th stria laterad, widely pale red. Clypeus and labrum, palpi, and antenna yellow to pale red. Femora pale yellow, tibiae and tarse slightly darker, pale red. Under surface more or less dark piceous, but lateral parts of thorax, and the whole abdomen paler, light brown to reddish-brown.

Head (Fig. 8). Of average size, dorsal surface fairly depressed. Eye large, laterad markedly protruded; orbit very short. Labrum in middle slightly incised; mandibles elongate, straight; palpi elongate, maxillary palpus sparsely pilose. Mentum with acute, unidentate tooth and two elongate setae. Antenna short, median antennomeres slightly longer than wide. Posterior supraorbital seta situated at posterior margin of eye. Frons slightly convex, frontal furrows wide, fairly deep, irregularly curved. Surface with extremely fine and sparse punctures which are only visible at very high magnification, with traces of very superficial irregularly transverse microreticulation, glossy.

Pronotum (Fig. 8). Rather wide, widest slightly in front of middle, dorsal surface fairly depressed. Base rather wide. Apex well excised; apical angle protruded and widely rounded at tip; lateral margin gently convex, in basal third oblique and straight; basal angle obtusely rounded; base laterally slightly convex, in middle straight. Apex and



Figure 8. *Perigona timorensis* sp. nov. (body length 3.7 mm).

middle of base not margined, lateral parts of base faintly margined. Lateral margin and channel anteriorly narrow, widened and explanate basad. Both transverse sulci shallow, median line distinct, slightly impressed, abbreviated on both ends. Anterior marginal seta situated at apical sixth, posterior marginal seta situated at basal angle. Extremely fine and sparse punctures barely recognizable even at high magnification; surface in middle without microreticulation, in the apical, lateral, and basal parts with extremely fine and superficial traces of microsculpture that is composed of transverse lines, very glossy.

Elytra (Fig. 8). Rather short and wide, widest slightly behind middle, dorsal surface moderately depressed. Humerus wide, slightly produced but widely rounded, lateral margin slightly convex throughout, apex regularly convex, slightly incurved towards suture. Lateral margin rather narrow, behind humerus extremely finely denticulate and sparsely setulose; subapical sulcus rather wide. At least five, in some specimens also six, median striae deeply impressed and almost complete, rather coarsely punctate. The anterior discal puncture situated at basal third, the median puncture behind middle, the third puncture far removed from the apex. The subapical marginal sulcus with sparse and very short pilosity. Surface apparently impunctate, without

microreticulation, very glossy, slightly iridescent.

Male genitalia (Fig. 16). Genital ring moderately wide, almost parallel-sided, with wide, oblique, asymmetric apex and very narrow base. Aedeagus very compact, very wide in middle; lower surface gently bisinuate. Apex straight, short, wide, almost symmetric, triangular. Internal sac with several narrow, variously coiled sclerotized rods and folds. Both parameres large and comparatively elongate, with oblique-convex apex.

Female gonocoxites. Very similar to that of *P. drumonti* Baehr, 2013 as figured in fig. 66 in Baehr (2013): Gonocoxite 1 large, without any setae at the apical rim. Gonocoxite 2 triangularly curved, with slightly obtuse apex; with one elongate ensiform seta in middle of the ventro-lateral margin, a large ensiform seta in middle of the dorso-median margin, and two attached nematiform setae originating from a groove in the apical third of the median margin.

Variation. Very little variation noted.

Distribution. Central part of Timor Leste.

Collecting circumstances. The species was sampled at light and in “bucket trap” in open *Eucalyptus* woodland with weeds, and at the edge of moss forest, both localities being slightly above 1000 m.

Remarks. This is the first species of *Perigona* explicitly recorded from Timor. However, apart from the widely distributed *P. nigriceps* (Dejean) which was also present in the examined material, other species are likely to occur on Timor, but have not yet detected as a consequence of the limited exploration of this island.

The new species in its external as well genitalic morphology is very similar to *P. punctatostrata* Baehr, 2013 from Sulawesi, less so to *P. moluccensis* Baehr, 2013 from the Moluccas. The close relationship to *P. punctatostrata* is best seen in the similarly shaped aedeagus and rather similarly structured internal sac. But also body shape, striation of the elytra, and surface structure are very similar, though the colouration is quite different. Apparently the new species forms a group with both mentioned species, which would suggest that it is a southern Oriental faunal element.

***Perigona* sp.**—1♀ ex. “Valu Sere Resort, opposite Jaco Is 8.40931S 127.29875E vine thicket on Is, 5mTL2012/004/019 mv bucket trap 26.v.2012” K402668 (AMS). The specimen is quite similar to *P. sumatrensis* Baehr, 2013, but for a reliable identification of these very similarly shaped and structured species the male genitalia are needed.

Tribe Harpalini

For the the harpaline fauna of the southern Oriental region virtually no revisions exist. Identification of species, in some instances even of genera, therefore is difficult. For some species Darlington’s (1968) revision of the New Guinean Harpalini may be of use, but the Australian Harpalini also are almost unrevised, so that comparisons are difficult or even impossible. Certainly careful revisions of most genera would be very useful, instead of descriptions of single species, which render identifications rather more difficult. Several species of this Timorese collection could be only identified to genus.

***Acupalpus* sp.**—2 ex. “beach house nr Baucau 8:4428S 126:46906E beach & foreshore mv bucket trap 10m, 5.vi.2012 TL2012/020/017” K402661 (AMS); “Los Palos

0.5k N Hotel Roberto Carlos 8°30'38"S 127°00'28"E low pasture on rich soil 10–12.xi.2011 c500m C.Reid Site 10" K402662 (AMS). The southern Oriental species of the genus *Acupalpus* Latreille, 1829, are undeterminable, until the revision which is being undertaken by B. Jäger (Berlin) is completed.

***Batoscelis oblongus* (Dejean, 1831).**—1 ex. "4k S Laga 8°31'13"S 126°33'39"E, cow dung, 5.vi.2012, TL2012/014/004" K402636 (AMS). A widely distributed species in the southern Oriental region, New Guinea, and in northern Australia. The specimen was collected sheltering under dried dung (CAMR).

***Coleolissus papua* Darlington, 1968.**—1 ex. "gorge 1k NE Laclubar 8°44'47"S 125°54'54"E uro/siamweed above gorge, at mv light 1030m 3.vi.2012 C. Reid TL2012/107/598" K402633 (AMS). This species also occurs in New Guinea and north-eastern Australia.

***Egadroma cf. robustum* (Sloane, 1907).**—2 ex. "Mt Laritame 8.69178S 126.38719E water tank, edge moss forest 1150m TL2012/011/016 b/light bucket trap 31.v.2012" K402666 (AMS); "Tutuala comm twr, 3k E Tutuala 8°23'57"S 127°17'02"E dry rf on Is c200m TL2012/003/026 yellow pans 25.v.2012" K402688 (AMS). The specimens are very similar to Australian specimens of *E. robustum*, but the Oriental and Australian species of this genus need revision.

***Gnathaphanus subolivaceus* (Macleay, 1825).**—1 ex. "c3k W Maubara 8°37'14"S 125°10'45"E at light, cleaning in closed forest 60m 20.xi.2011 V. Kessner, Z. Afranio TL145/11" K402639 (AMS). The species was recorded from Sulawesi and some Lesser Sunda Islands.

***Gnathaphanus timorensis* (Schauberger, 1934).**—12 (Timor): not collected.

***Gnathaphanus upolensis* (Csiki, 1915).**—3 ex. "c3k W Maubara 8°37'14"S 125°10'45"E at light, clearing in closed forest 60m 20.xi.2011 V. Kessner, Z. Afranio TL145/11" K402635 (AMS); "Kablaki Hotel, Same 8°59'60"S 125°38'53"E at mv light opposite field 490m 25.v.2012 C.Reid TL2012/082/540" K402634 (AMS); "c1k N Daisna 9.06130S 125.68174E euc 'alba' forest 200m 13.xi.2011 C. Reid Site 32 under log" K402637 (AMS). A very widespread species in the southern Oriental Region, New Guinea, Australia and the Pacific.

?*Harpaliscus* sp. 1—1 ex. "c3k W Maubara 8°37'14"S 125°10'45"E at light, clearing in closed forest 60m 20.xi.2011 V. Kessner, Z. Afranio TL145/11" K402641 (AMS). The specimen is tentatively referred to the genus *Harpaliscus* Bates, 1892. However, it may belong to another, possibly undescribed, genus. Unfortunately, the Harpalini from the insular part of the Oriental Region are very difficult and badly in need of a general revision, because even the status of some genera is disputable.

?*Harpaliscus* sp. 2—1 ex. "River xing 17k S Manatuto on Laclubar Rd 8°37'50"S 125°59'22"E grazed shinglebank 230m 3.vi.2012 C. Reid TL2012/105/572 under stones" K402642 (AMS). Another species tentatively referred to *Harpaliscus*.

***Lampetes* sp.**—6 ex. "gorge 1k NE Laclubar 8°44'47"S 125°54'54"E uro/siamweed above gorge, at mv light 1030m 3.vi.2012 C. Reid TL2012/107/598" K402627–631 (AMS); "Quelicaï guest house (8°36'12"S 126°33'39"E) 02/06/2012,

black light bucket trap TL2012/015/053" K402632 (AMS). The genus *Lampetes* Andrewes, 1940 is badly in need of a revision, because not even the limits of the genus are settled.

***Platymetopus* nr. *subrugosus* Schaubberger, 1938.**—1 ex. "c3k W Maubara 8°37'14"S 125°10'45"E at light, clearing in closed forest 60m 20.xi.2011 V. Kessner, Z. Afranio TL145/11" K402640 (AMS). The specimen is different from most Oriental species of this genus known to MB, also from the single species recorded from New Guinea (Darlington, 1968). It is most similar to *P. subrugosus* from Sulawesi, but, as the Oriental species of the genus *Platymetopus* Dejean, 1828 need revision, the identity is doubtful.

Tribe Harpalini, subtribe Amblystomina

This subtribe is sometimes included in, or treated as a synonym, of Harpalina (Bouchard *et al.*, 2011). Revisions of the southern Oriental species, as well as of the Australian Amblystomina, are very much required.

***Amblystomus quadriguttatus* (Motschulsky, 1858).**—2 ex. "Loi Huno 8.77836S 126.37078E pasture/vine thicket 280m TL2012/008/044 black light trap @ hotel 29.v.2012" K402665 (AMS); "Fatukama E of Dili 8:31.585S 125:39.727E dry acacia scrub, beach shingle 5m 8.xi.2011 C. Reid Site 2 cow dung" K402664 (AMS). A common species in the southern Oriental Region and in northern Australia. The specimen at Fatukama was collected sheltering under dried dung (CAMR).

***Amblystomus* sp.**—1 ex. "Hatoudo 8°58'55"S 125°37'27"E riverine rain forest, 735m 27.v.2012 C.Reid TL2012/088/546 light sheet" K402663 (AMS). In view of the lack of revisions of the southern Oriental as well as Australian species this is not determinable.

Tribe Licinini

The Australian Licinini need to be revised on the generic level, and most genera also need taxonomic revisions. Therefore identifications are difficult or impossible.

***Lacordairea* sp.**—1 ex. "Ramelau sum't plat. 8°54'51"S 125°39'31"E 28/05/2012 stunted eucs/vaccinium/moss/grass 2750m C. Reid grass tufting TL2012/090/575" K402667 (AMS). The specimen is doubtfully assigned to the Australian genus *Lacordairea* Castelnau, 1867. This genus, however, is urgently in need of a revision, therefore, reliable identifications are almost impossible.

Tribe Chlaeniini

This tribe is extremely numerous in the Oriental region, where a multitude of often similar species exist. Unfortunately almost no reliable revisions are available for the Oriental fauna, therefore identifications are almost only possible by comparisons with types or identified species.

***Chlaenius flaviguttatus* Macleay, 1825.**—1 ex. "c3k W Maubara 8°37'14"S 125°10'45"E at light, clearing in closed forest 60m 20.xi.2011 V. Kessner, Z. Afranio TL145/11" K402679 (AMS). A widespread species in the southern Oriental Region and in New Guinea.

***Chlaenius timorensis* Darlington, 1970** (Timor): not collected.

***Chlaenius* sp.**—1 ex. "up rd NW Same 8:97032S 125:60821E coffee plantn by stream, 1065m 14.xi.2011 C.

Reid Site 35 under log" K402678 (AMS). A large species probably related to *C. femoratus* Dejean, 1826, which occurs on Borneo.

Tribe Lebiini

A very large tribe with about a dozen subtribes. However, the subtribal systematics is controversial, therefore in the present paper subtribes are neglected. Many genera in the Oriental and Australian fauna have not yet been revised, therefore identifications are difficult or impossible. However, the Oriental to Australian genus *Anomotarus* was recently revised by Baehr (2003c) for the region including Timor, with two Timorese species described. These were collected in the present survey, together with another species described in that work from the Indonesian islands.

Anomotarus apicalis Baehr, 2003c.—6 ex. "gorge 1k NE Laclubar 8°44'47"S 125°54'54"E siamweed above gorge, at mv light 1030m C.Reid TL2012/107/598" K402505–509 (AMS), K402504 (CBM). This species is apparently endemic to Timor.

Anomotarus latiplaga Baehr, 2003c.—1 ex. "Hatubuilco Rd 11.5km W t'off h'way 8°53'12"S 125°32'49"E E urophylla/Vacc pasture/gully 2050m 28.v.2012 C.Reid TL2012/080/762" K402502 (AMS). *Anomotarus latiplaga* was described from Java, Bali and Adonara (Baehr, 2003c). This is the first record from Timor.

Anomotarus timorensis Baehr, 2003c.—1 ex. "Ramelau sum't plat. 8°54'51"S 125°39'31"E 28/05/2012 stunted eucs/vaccinium/moss/grass 2750m C. Reid grass tufting TL2012/090/575" K402503 (AMS). Another species apparently endemic to Timor.

Aristolebia Bates, 1892

Aristolebia Bates, 1892, *Viaggio di Leonardo Fea in Birmania e regione vicine*. XLIV. List of the Carabidae. *Annali del Museo Civico di Storia Naturale de Genova* 32: 428. Type species: *Aristolebia quadridentata* Bates, 1892, by monotypy.

Diagnosis. Main diagnostic characters of the genus *Aristolebia* are: wide, depressed body; large, semicircular, laterally much protruded eye; semicircular pronotum without definite apical angles; angulate external angle of the elytra; concave excision of the apex of the elytra; presence of two preapical excisions at the inner surface of the mesotibia in the male; apparently also the odd-shaped, very strongly sclerotized aedeagus and the likewise odd-shaped and comparatively very large genital ring; and wide, more or less triangular, asetose gonocoxite 2 of the female.

In many other characters *Aristolebia* is rather similar to the large genus *Lebia* Latreille, 1802 (*sensu lato*) which is certainly closely related.

The fourteen presently recorded species of the genus *Aristolebia* are distributed from southern India to China, the Philippines, Sumatra, Sulawesi, Flores, New Guinea, and northern Australia (Csiki, 1932; Jedlicka, 1963; Darlington, 1968; Moore *et al.*, 1987; Kabak, 2003; Baehr, 2004b; 2010d; 2011; 2015a; Lorenz, 2005; Kirschenhofer, 2012). Most species of this genus are only available in small numbers and some are even known just from the holotype, which deficiency most probably is caused by the almost unrecorded habits of the species and, as a consequence, by

the inadequate sampling methods employed. The new species described herein is likewise available only as the holotype. However, in view of the very characteristic colour patterns of pronotum and elytra in almost all species of *Aristolebia* and of the characteristically and rather differently shaped female gonocoxites (see Baehr, 2010; 2015a), it is considered reasonable to describe the new species on the basis of a single female.

The few records and the apparent difficulties in sampling of specimens suggest that the present distribution of the species, as well as the species diversity, are quite inadequately known, and that additional species may be detected in future within, but probably also outside of the hitherto recorded range of the genus.

Aristolebia timorensis sp. nov. Baehr

Figs 9, 22

Holotype ♀, "TIMOR LESTE c3k W Maubara 8.37'14"S 125.10'45"E at light, clearing in closed forest 60m 20.xi.2011 V. Kessner, C. Afrano TL145/11" K402684 (AMS).

Etymology. The name refers to the occurrence of this species on the island of Timor.

Diagnosis. Moderately large species (in genus), distinguished from all vividly patterned species except *A. oculata* Baehr, 2010, *A. triramosa* Baehr, 2010, and *A. floreana* Baehr, 2011 by presence of a red spot in the posterior half of the elytra. From these three species distinguished by the distinct pale lateral margin of the pronotum and slightly different colour pattern of the elytra, particularly the narrow, oblique, rhomboidal posterior elytral spot. From the nearest related species, *A. floreana* and *A. timorensis* also distinguished by narrower pronotum and longer elytra.

Description. Measurements. Body length: 8.9 mm; width: 3.8 mm. Width/length of pronotum: 1.49; width of pronotum/width of head: 1.32; length/width of elytra: 1.57; width of elytra/width of pronotum 1.65.

Colour (Fig. 9). Head black, labrum and mandibles reddish brown, palpi and antenna pale red; pronotum black with distinct, wide pale lateral margins; elytra black with a pale red pattern, which consists of a large, oblique spot in basal half which is narrowly separated at suture, separated by a narrow black stripe from the lateral border, and narrowly attains the base, and with a narrow, oblique, rhomboidal spot from mid of 3rd to 8th interval in apical half that is widely separated from apex. The median basal area as well as the whole apex is black. The lateral margin is very narrowly pale red. Legs yellow with the tibiae very slightly darker. Epipleurae of prothorax and elytra yellow, rest of lower surface reddish-piceous, abdomen apical darker.

Head (Fig. 9). Of moderate size. Eye very large, semicircular, laterad remarkably protruded, orbit not perceptible. Neck with fairly deep transverse impression. Labrum anteriorly straight, 6-setose. Mentum with very shallow, apically transverse or very slightly rounded convexity. Glossa elongate, polysetose at apex, paraglossae wide, foliaceous, as long as glossa and fused to it, densely setose at margin. Galea with wide, rather depressed last segment that is extremely densely pilose. Lacinia large, with very elongate terminal hook and rather dense row of teeth at inner margin. Palpi of normal size, very sparsely pilose. Mentum asetose, but submentum with a very elongate seta



Figure 9. *Aristolebia timorensis* sp. nov. (body length 8.9 mm).

at either side. Mandibles short and wide, evenly curved. Antenna elongate, surpassing base of pronotum by three antennomeres, pilose from 4th antennomere, 6th and 7th antennomeres almost $3 \times$ as long as wide. Labrum and clypeus with fine and sparse punctures, frons and neck with some wrinkles and with coarse and rather dense punctures that are anteriorly rather corrugated. Microreticulation present but extremely very superficial and fine, barely recognizable, isodiametric, therefore surface glossy.

Pronotum (Fig. 9). Rather wide. Anteriorly half about semicircular, widest slightly behind middle, little narrowed towards base, therefore base much wider than apex. Apex slightly concave, apical angles very widely rounded, lateral margin convex, in basal half oblique and almost straight, basal angle slightly more than rectangular, slightly obtuse at tip, base in middle slightly produced, laterally almost straight. Apex narrowly margined, base in middle coarsely, laterally more finely margined. Anterior transverse sulcus and median line rather deep, sulcus situated close to apex. Posterior transverse sulcus deeply impressed. Lateral margin anteriorly moderately wide, widened and widely explanate towards base. Disk gently convex. Anterior lateral seta situated about at anterior third, slightly removed from margin, posterior seta situated at basal angle. Surface of disk very irregular, corrugated striae, barely punctate, only with finest traces of extremely superficial, isodiametric microreticulation, glossy.

Elytra (Fig. 9). Moderately elongate, fairly wide, widened towards apex, widest about at apical third, upper surface depressed. Humerus evenly rounded, lateral margin evenly convex. External apical angle angulate, forming a short, acute denticle. Sutural angle angulate but not spined, with a tiny denticle; apex oblique, gently bisinate, only near the external angle slightly excised. Striae complete, well impressed, finely crenulate. Intervals moderately raised, slightly convex. 3rd interval with two setiferous punctures, both situated at inner margin of 3rd stria, the anterior one at about basal third, the posterior one behind apical fourth. 14 marginal setiferous punctures present, series slightly interrupted in middle. Punctures of intervals sparse but distinct, irregularly uniseriate, in parts biseriate. Intervals with distinct though slightly superficial, about isodiametric microreticulation which is arranged in irregularly transverse rows, with sparse, extremely short, erect pilosity that is visible only from laterally and at high magnification; surface rather glossy. Posterior wings fully developed.

Lower surface. Prosternal process with an elongate seta at middle. Prosternum, metasternum, and abdomen with moderately sparse, elongate, erect to slightly declined pilosity. Metepisternum elongate, $>2 \times$ as long as wide at anterior margin. Terminal sternum in female with 2, *resp.* 3 setae at either side.

Legs. Of average size. 4th tarsomeres of all legs widened, deeply ($>$ half of tarsomere) excised, with dense tarsal brush. 5th tarsomere with two rows of several setae on the lower margin. Claws with 9 elongate teeth.

Male genitalia. Unknown.

Female gonocoxites (Fig. 22). Foliaceous. Gonocoxite 1 large, little sclerotized, only the lateral rim narrowly sclerotized, without setae at the apical rim. Gonocoxite 2 short and wide, only partly, but weakly sclerotized, but the lateral and latero-ventral margins narrowly sclerotized, with a small hyaline lateral area, asetose. The ventral and ventro-lateral margins of the lateral plate strongly sclerotized, with a triangular appendix at the ventro-lateral margin.

Variation. Unknown.

Distribution. Western part of Timor Leste. Recorded only from the type locality.

Collecting circumstances. Sampled at light in clearing in closed forest at low altitude.

Relationships. Based on similar body size, shape, and colour pattern of the elytra, this species is probably closest to *A. floreana* Baehr, 2011, recorded from the neighbouring island of Flores, less so to *A. triramosa* Baehr, 2010 and *A. oculata* Baehr, 2010, both from Sulawesi. These four species apparently form a distinct species group that is confined to the southeastern part of the Indonesian Archipelago (Wallacea).

Revised partial key to *Aristolebia* Bates

When using Baehr's (2011) key, couplet 8 is easily reached. From this couplet the key has to be altered as below. For comparison, figures given in Baehr's 2010 and 2011 works are included (Baehr, 2010d, 2011).

- 8 Apical half of elytra black with a large red spot on either elytron (Fig. 9; Baehr, 2010: figs 3, 4; Baehr, 2011: fig. 4). Sulawesi, Flores, Timor 9
- Elytra either black with a large red spot in basal half on either elytron, or with a black spot along suture which is widened behind scutellum and in apical half 11
- 9 Elytra with a contiguous dark sublateral stripe, i.e. the yellow humeral spot does not touch the lateral margin (Fig. 9; Baehr, 2010: fig. 4; Baehr, 2011: fig. 4); aedeagus as in Baehr, 2010: fig. 8 and Baehr, 2011: fig. 2, or unknown 10a
- Elytra without contiguous dark sublateral stripe i.e. the yellow humeral spot widely meets the lateral margin (Baehr, 2010: fig. 3); aedeagus unknown. West Sulawesi *A. oculata* Baehr, 2010
- 10a The posterior pale spot on the elytra large, broadly attaining the apical margin; pronotum uniformly pale red (Baehr, 2010: fig. 4); tarsal claws with 7 small teeth; aedeagus wide, markedly sinuate, and with acute. Spine-shaped apex (Baehr, 2010: fig. 8); body length >9.5 mm. North Sulawesi *A. triramosa* Baehr, 2010
- The posterior pale spot on the elytra small, completely encircled by dark colour; pronotum uniformly reddish-brown or black with more or less distinct pale margin (Fig. 1; Baehr, 2011: fig. 4); tarsal claws with 9 small teeth; aedeagus narrower, less sinuate, and regularly triangular apex (Baehr, 2011: fig. 2), or unknown; body length < 9 mm. Flores, Timor 10b
- 10b Pronotum almost uniformly reddish-brown without clearly defined pale lateral margin; anterior pale elytral spot contiguous at suture; posterior spot circular; aedeagus see Baehr, 2011: fig. 2. Flores *A. floreana* Baehr, 2011
- Pronotum black with distinct pale lateral margin; anterior pale elytral spot narrowly separated at suture; posterior spot narrow, oblique, and rhomboidal (Fig. 9); aedeagus unknown. Timor *A. timorensis* sp. nov.
- 11 Elytra black with a large red spot in basal half on either elytron. Burma, Thailand, south-eastern China *A. quadridentata* Bates, 1892
- Elytra with a black spot along suture which is widened behind scutellum and in apical half. New Guinea, northern Australia *A. mucronata* (Sloane, 1907)

Remarks. The discovery of an additional new species from the island of Timor again demonstrates that neither distribution nor number of species of the genus *Aristolebia* are adequately known. The reason for this deficiency most

probably is the very unsatisfactory knowledge that we have about the habits of any species, so that specimens of *Aristolebia* are only casually collected and have not been, or presently cannot be, systematically sampled.

However, the four mentioned species from Sulawesi, Flores, and Timor form a distinct group of closely related species which so far has no close relatives, neither in the northern part of the Indonesian Archipelago, nor on neighbouring New Guinea and Australia,

Although almost nothing has been reported about ecology or ethology of any *Aristolebia* species, it seems that they are arboreal (Darlington, 1968) and may live primarily in rain forest. The wide tarsi and the strongly denticulate tarsal claws would support this assumption. However, whether they live preferably on logs or trunks, or rather on twigs and leaves, or in the canopy, is unknown. Darlington suggests that at least the New Guinean species are diurnal, but he also notes that some specimens have been sampled in light traps (like *A. timorensis*), which means that they are also roaming about at night. Nothing is known about feeding habits and food, but the large, protruding eyes suggest that they have good sight and may be diurnal predators.

It is to be expected that additional, more systematic, sampling activities in combination with better knowledge of their habits will further increase the number of species and better depict their distribution. Such sampling should include fogging bark of logs and trunks and of leaves and canopy.

***Coptodera ornatipennis* Louwerens, 1949.**—3 ex. “gorge 1k NE Laclubar 8°44'47"S 125°54'54"E siamweed above gorge, at mv light 1030m C.Reid TL2012/107/598” K402518–520 (AMS). This species was described from Sulawesi. It also occurs on New Guinea.

Lebia Latreille, 1802

Lebia Latreille, 1802: Histoire naturelle, générale et particulière des crustacés et des insectes. Ouvrage faisant suite à l'histoire naturelle générale et particulière, composée par Leclerc de Buffon, et rédigée par C. S. Sonnini, membre de plusieurs sociétés savantes. Familles naturelles des genres. Tome troisième: 85. Type species: *Carabus haemorrhoidalis* Fabricius, 1792 (= *Buprestis marginatus* Geoffroy in Fourcroy, 1785), by subsequent designation (Andrewes, 1935).

The very large genus *Lebia* (*s. l.*) is distributed worldwide with a large number of species described from the Oriental region. Authors differ in how the genus should be subdivided, or, whether it should be retained as a single genus. However, this is a matter of opinion about the supraspecific hierarchy which will not be discussed herein in detail.

Unfortunately no general revision of the Oriental species of the genus *Lebia* is available, because the paper of Jedlicka (1963) includes only a part of the then described species and, moreover, does not use genitalic characters for characterization and differentiation of the species; and the key in Habu (1967) covers only the Japanese species.

The matter has recently been made worse, because Kirschenhofer in a couple of papers (e.g., Kirschenhofer, 2009a,b) described various, mostly very similar, species from the Oriental Region, either from single females, or if males are involved, without describing or figuring the internal structures of the aedeagus which in many *Lebia* are very characteristic and complex, because the internal sac may bear variously shaped and located teeth, spines, or

spinose plates. This taxonomic procedure does not really improve our knowledge and renders work on this genus rather more difficult.

Therefore, unfortunately, the internal structures of the male genitalia of almost no Oriental *Lebia* have been examined, which makes identification of species difficult. Sorting of species only using body size, shape, and colour pattern as differentiating characters is compromised by the presence of several very similarly shaped and coloured species, and also infraspecific variation in some widely ranging species.

The Papuan species have been keyed by Darlington (1968) in his monumental treatise of the New Guinean Carabidae, and the species of the Australian and Papuan Regions were recently revised by Baehr (2004a), who added several species in a number of supplementary papers, of which that from 2012 (Baehr, 2012c) for the present paper is most important.

***Lebia timorensis* sp. nov. Baehr**

Figs 10, 17

Holotype ♂, “TIMOR LESTE Mt Laritame 8.69178S 126.38719E water tank, edge moss forest 1150m TL2012/011/016 mv light bucket trap 31.v.2012” K402493 (AMS).

Paratypes (3): 2♂♂, same data as holotype, K402495 (AMS), K402494 (CBM); 1♂, “TIMOR LESTE Hatoudo 8°58'55"S 125°37'27"E riverine rain forest, 735m 27.v.2012 C.Reid TL2012/088/562 mv lamp” K402492 (AMS).

Etymology. The name refers to the range of this species, the island of Timor.

Diagnosis. Rather small, unicolourous yellow species; distinguished from the most similar species *L. keiana* Baehr, 2012 by basally distinctly sinuate lateral margins of the pronotum, longer elytra, and different arrangement of the denticulate folds in the internal sac of the aedeagus.

Description. Measurements. Body length: 4.3–5.0 mm; width: 2.05–2.4 mm. width/length of pronotum: 1.44–1.57; width pronotum/head: 1.17–1.21; length/width of elytra: 1.37–1.41; width elytra/pronotum: 1.86–1.95.

Colour (Fig. 10). Upper and lower surfaces uniformly yellow to pale reddish; mouth parts, palpi, antennae, and legs yellow. Elytra without any pattern.

Head (Fig. 10). Of average size and shape, slightly narrower than the pronotum. Eye very large, semicircular. Antenna of moderate size, surpassing the basal angle of the pronotum by about two antennomeres. Labrum in middle gently impressed. Frons with short, shallow, slightly irregular frontal impressions, in middle with a more or less distinct, shallow, triangular impression. Surface with distinct though slightly superficial, about isodiametric microreticulation, with scattered, fine punctures, glossy.

Pronotum (Fig. 10). Wide, considerably wider than head, widest at or slightly in front of middle, slightly narrowed basad. Apical angle widely rounded off, lateral margin anteriorly very convex, from middle slightly oblique-convex, in front of the produced, less than rectangular, basal angle distinctly sinuate. Base in middle much produced, lateral excision deep, lateral parts of base transversal, almost straight. Apex laterally margined, in middle not or indistinctly margined, base in middle coarsely margined. Lateral margin explanate throughout, explanation even widened basad, marginal channel fairly deep. Surface with



Figure 10. *Lebia timorensis* sp. nov. (body length 4.4 mm).

a distinct, moderately deep prebasal transverse sulcus. Disk with quite irregular, concave wrinkles that are more pronounced in basal half; with distinct, about isodiametric microreticulation which is finer and more superficial in the apical half and rugose in middle of the basal half; and with sparse, very fine punctures, surface rather dull to moderately glossy.

Elytra (Fig. 10). Moderately short (in group), oval-shaped, markedly widened towards apex, widest well behind middle. Upper surface slightly convex. Humerus rounded, lateral margin slightly convex throughout, only apical markedly convex, barely incized at basal third. Apical angle widely rounded, apex faintly sinuate, apical margin slightly incurved at suture. Striae complete, deep, at bottom very finely crenulate. Intervals convex throughout. 3rd interval bipunctate, punctures situated at 3rd stria. Series of marginal punctures composed of 13–14 punctures, the penultimate one removed from margin; series not interrupted in middle. Intervals with distinct but slightly superficial, rather transverse microreticulation and very scattered punctures which are barely recognizable, rather glossy. Metathoracic wings fully developed.

Lower surface. Metepisternum rather elongate, slightly less than $2 \times$ as long as wide. Prosternum with a few short hairs in middle; abdominal sterna very sparsely pilose, pilosity slightly denser on terminal sternum. Male terminal sternum quadrisetose.

Legs. Of moderate size. 4th tarsomeres very deeply excised. Tarsal claws with 4 large teeth. 1st–3rd male tarsomeres sparsely, biserially squamose.

Male genitalia (Fig. 17). Genitalia very similar to those of *L. keinana* Baehr, 2012. Genital ring large, rather elongate, fairly asymmetric, remarkably widened towards apex, with wide, oblique and convex apex and narrow, elongate basis. Aedeagus moderately elongate, slightly widened in middle, barely sinuate, lower surface very gently concave. Apex rather elongate, depressed, straight, triangular. Orificium rather short, situated mainly on the upper surface. Folding of internal sac complex, with a transverse, densely spinose sclerite in middle that is interrupted at bottom, and another straight fold in middle of bottom that consists of 5 rather large spines. Parameres of dissimilar shape, left paramere short in comparison, though longer than right one, with obtusely triangular apex; right paramere short but massive, rhomboidal.

Female gonocoxites. Unknown.

Variation. Rather uniform species, but the largest specimen bears a comparably narrow pronotum.

Distribution. Western part of Timor Leste.

Collecting circumstances. All specimens collected at light, in moss or rain forest at median altitude.

Relationships. With respect to body shape, colouration and structure of the internal sac of the aedeagus this species is very similar, and probably most closely related, to *L. keinana* Baehr, 2012 from nearby Kei Islands. According to shape and structure of the aedeagus the new species and *L. keinana* form a group of fairly similar species together with *L. subglabra* Baehr, 2004 from New Guinea, *L. novabritannica* Baehr, 2004 from New Britain, and *L. salomona* Baehr, 2004 from Solomon Islands.

Remarks. *Lebia timorensis* is the first species of the genus *Lebia* explicitly recorded from Timor. But this probably is a consequence of the almost non-existent exploration of that island. Additional species from other species groups in future will be detected on Timor, as biological exploration of this island is intensified.

The new species forms a distinct species group together with a number of similarly shaped, but not always similarly coloured, species that possess structurally rather similar male genitalia, as noted above. These species occur on the nearby Kei Islands, on New Guinea, New Britain, and certain islands of the Solomon Archipelago. The group may include additional, not yet detected or described species from the mentioned area, perhaps even from other islands. However, the distribution of the group clearly demonstrates its Papuan provenance, and thus, the new species from Timor is a Papuan faunal element rather than an Oriental one.

***Peliocypas* sp. 1.**—1 ex. “7k E Laclubar on Manatuto rd 8°44'39"S 125°58'29"E grassy bog/stunted E uro/Melastoma 1180m 4.vi.2012 C. Reid TL2012/108/600” K402501 (AMS). The Asian species of the genus *Peliocypas* Schmidt-Goebel, 1846 are badly in need of revision, particularly those of the southern Oriental Region. Although apparently

no species of the genus has been recorded from Timor, we refrain from describing any new species, as long as the fauna of Sulawesi, the Moluccas, and the Lesser Sunda Islands has not been satisfactorily worked.

***Peliocypas* sp. 2.**—4 ex. “c 8k NE Maubisse 8:49'33"S 125:37'21"E steep limestone grassland 1600m 16.xi.2011 C. Reid site 47” K402498–500 (AMS); “1k E Mt. Acalara, Turiscas Rd 4.5k from h'way 8°49'45"S 125°37'40"E E uro woodland/vacc on ridge 1625m 31.v.2012 C.Reid, TL2012/096/749” K402496 (AMS).

***Peliocypas* sp. 3.**—1 ex. “Mt Laritame 8.6918°S 126.3872°E water tank, edge moss forest, 1150m TL2012/ 011/016 bucket trap 31.v.2012” K402497 (AMS).

Tribe Zuphiini, subtribe Planetina

The tribal status of the subtribe Planetina is controversial. It is either included in Zuphiini, or in Galeritini (e.g., Bouchard *et al.*, 2011). For the present paper, however, the genus *Planetes* is included in Zuphiini.

***Planetes* sp.**—2 ex. “Tutuala comm twr, 3k E Tutuala 8°23'57"S 27°17'02"E dry rf on Is c200m TL2012/003/004 yellow pans 25.v.2012” K402685–686 (AMS). The Oriental species of the genus *Planetes* Macleay, 1825 urgently need a revision, whereas the New Guinean and Australian species are moderately well known (Darlington, 1968; Baehr, 1986). The specimens from Timor do not belong to any described Australian and New Guinean species. Therefore at present they cannot be identified to species.

Brachininae

The subfamily and tribe Brachinini is rather poorly represented in New Guinea and Australia, where almost exclusively the genus *Pheropsophus* (s. l.) Solier, 1834 occurs. For the Oriental Brachinini only old or partial revisions exist, which, however, are inadequate for the southern part of the Oriental Region.

***Styphlomerus timorensis* (Jordan, 1894).**—2 ex. “E side Mt Kuri 4km W Manatuto 8°30'31"S 125°58'59"E dry thorn scrub/rf by spring 130m 2.vi.2012 C. Reid TL2012/103/594 swept,” K402512 (AMS), K402513 (CBM). The genus *Styphlomerus* Chaudoir, 1875 is widely distributed in the Afrotropical and Oriental Regions, but apparently does not occur in New Guinea and Australia. Particularly the southern oriental species are in need of revision. This species is so far only recorded from Timor (as *Brachinus*—Jordan, 1894).

***Styphlomerus* sp.**—2 ex. “c3k W Maubara 8:37'14"S 125:10'45"E at light, clearing in closed forest 60m 20.xi.2011 V. Kessner, C. Afranio TL145/11” K402510–511 (AMS). Probably a new species, closely related to the foregoing species.

Biogeographical remarks

The present sample certainly covers only a fairly small part of the carabid fauna of Timor, as 28 of the 53 collected species are represented by singletons. With that proviso, we present some preliminary thoughts about the composition, in a biogeographical sense, of the fauna. About two thirds of the mentioned species belong to, or at least have their

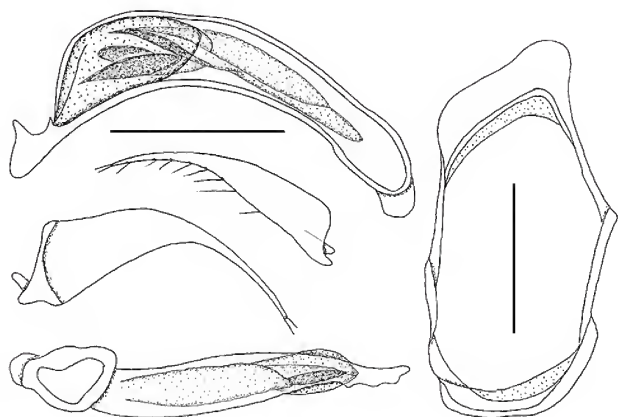


Figure 11. *Mecyclothorax timorensis* sp. nov. male genitalia: aedeagus right side and lower surface, parameres, genital ring. Scales 0.5 mm.

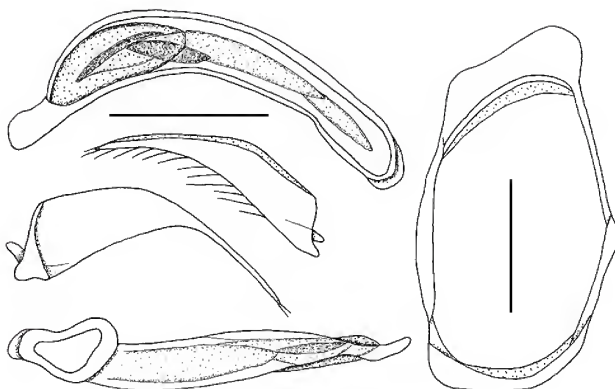


Figure 12. *Mecyclothorax reidi* sp. nov. male genitalia: aedeagus right side and lower surface, parameres, genital ring. Scales 0.5 mm.

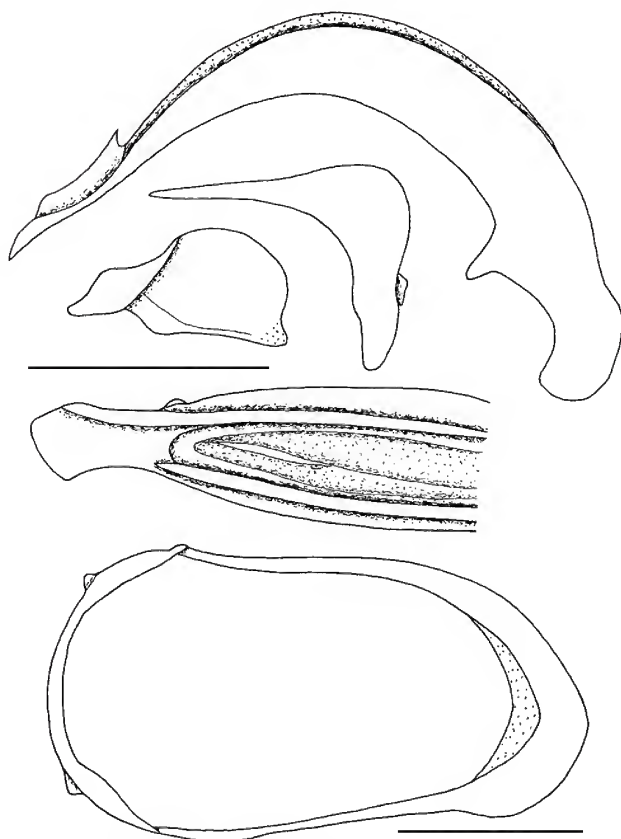


Figure 13. *Rhytisternus externus* sp. nov. male genitalia: aedeagus left side, parameres, genital ring. Scales 1 mm.

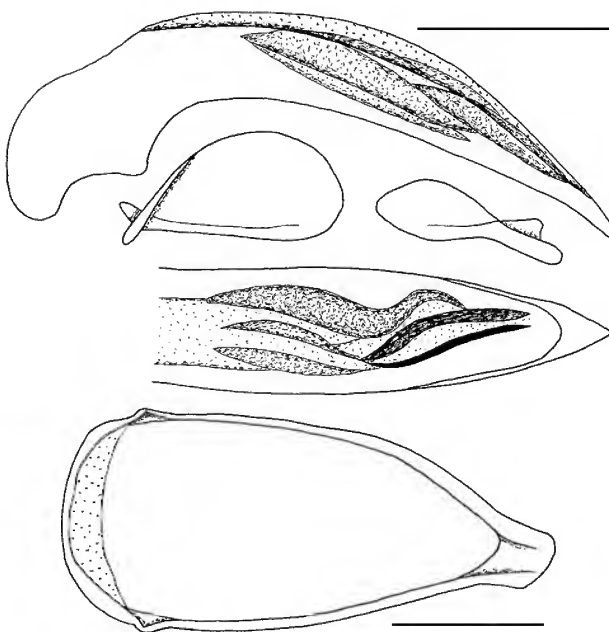


Figure 14. *Notagonum reidi* sp. nov. male genitalia: aedeagus left side, parameres, genital ring. Scales 1 mm.

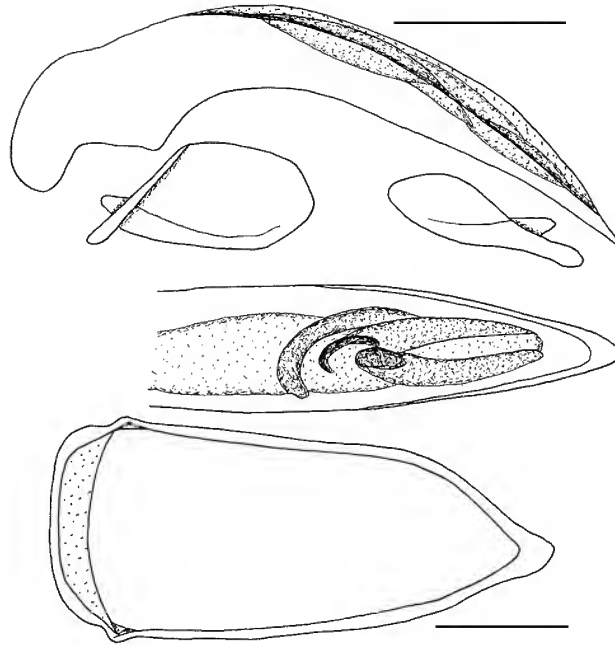


Figure 15. *Notagonum angusticolle* sp. nov. male genitalia: aedeagus left side, parameres, genital ring. Scales 0.5 mm.

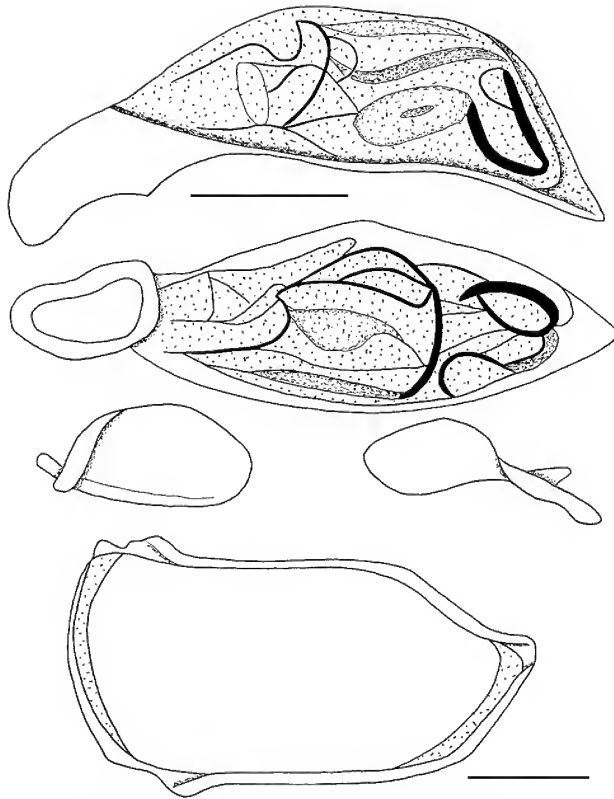


Figure 16. *Perigona timorensis* sp. nov. male genitalia: aedeagus left side, parameres, genital ring. Scales 0.25 mm.

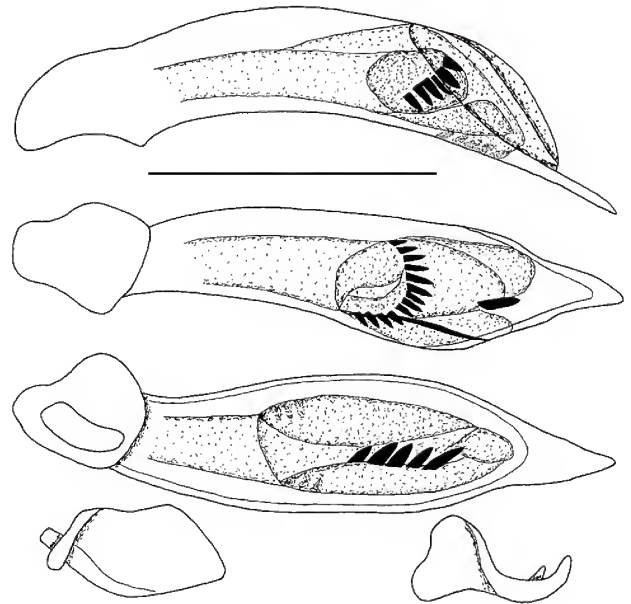
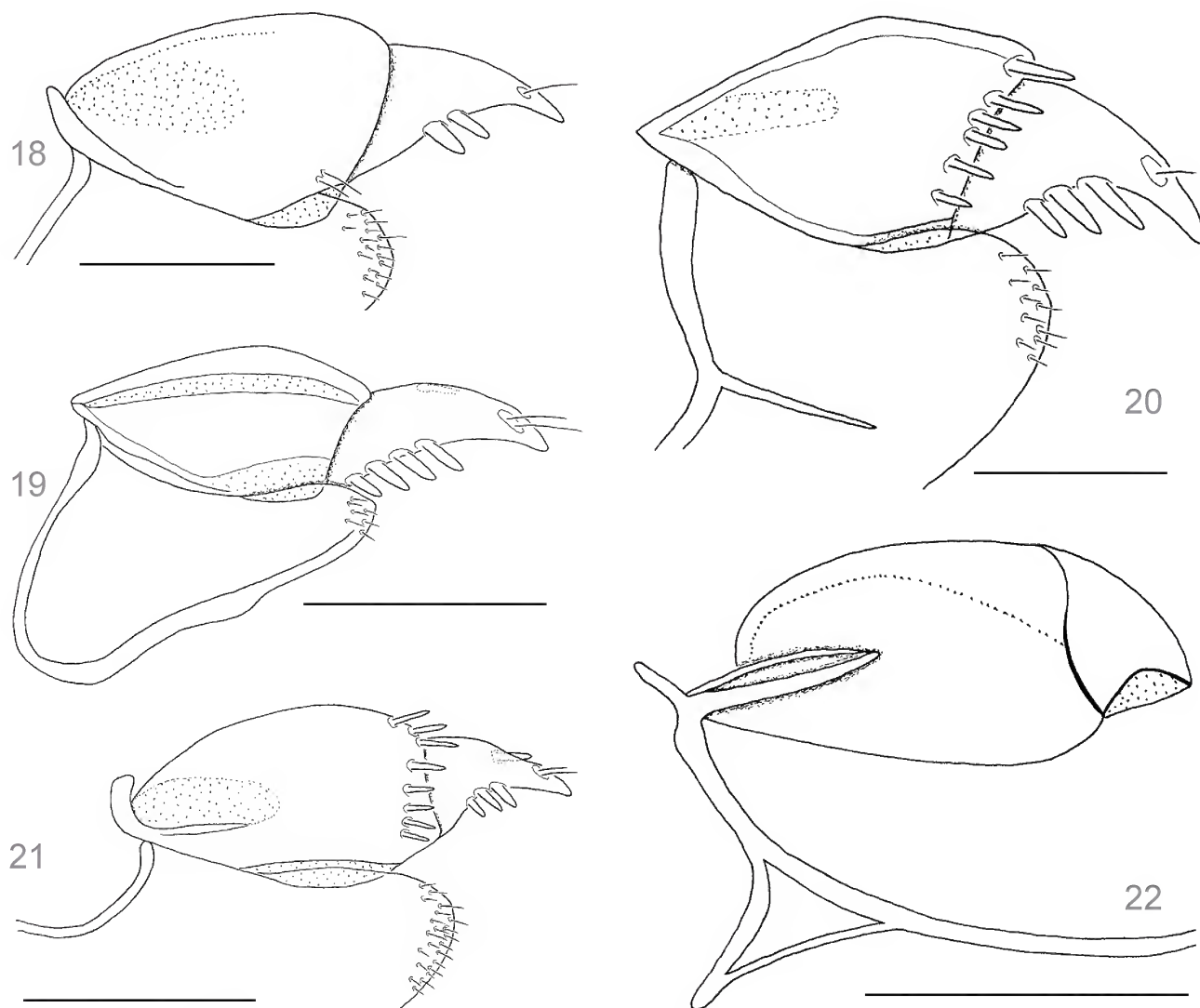


Figure 17. *Lebia timorensis* sp. nov. male genitalia: aedeagus left side, parameres, genital ring. Scale 0.5 mm.



Figures 18–22. Female gonocoxites 1 and 2. (18) *Mecyclothorax timorensis* sp. nov. (scale 0.1 mm). (19) *Rhytisternus externus* sp. nov. (scale 0.5 mm). (20) *Arhytinus timorensis* sp. nov. (scale 0.25 mm). (21) *Notagonum reidi* sp. nov. (scale 0.25 mm). (22) *Aristolebia timorensis* sp. nov. (scale 0.5 mm).

roots in, the Oriental Faunal Region, whereas about one third rather belong to the Australopapuan Region, either the Papuan or Australian Subregions. The discussion, whether the Papuan fauna merits a separate region, whether it should be subordered under the Australian Region, will not be discussed herein, because for the present question it is of secondary value. The main question is rather, which elements have reached Timor from the west or north-west, which from the east or south.

With respect to genera, the following genera clearly are Oriental faunal elements, diverse in southeast Asia but either absent in New Guinea and Australia, or with only few representatives: *Caelostomus*, *Arhytinus*, *Colpodes*, *Dicranoncus*, *Euplynes*, *Acupalpus*, *Batoscelis*, *Coleolissus*, *Egadroma*, *Harpaliscus*, *Lampetes*, *Platymetopus*, *Aristolebia*, *Peliocypas*, *Planetes*, and *Styphlomerus*.

The following genera belong to the Australopapuan fauna: *Mecyclothorax*, *Prosopogmus*, *Rhytisternus*, *Altagonum*, *Notagonum*, and *Lacordairea*.

Genera which are speciose in the whole Oriental-Australopapuan realm are: *Clivina*, *Perileptus*, all Tachyine genera mentioned, *Gnathaphanus*, *Morion*, *Perigona*, *Amblystomus*, *Chlaenius*, *Anomotarus*, and *Lebia*. Most of these, however, are probably rather of Oriental origin, but have large numbers of species in the Papuan and/or Australian Regions.

With respect to species the distribution is slightly different, because some species from genera of predominantly Oriental distribution either are endemic in Timor (see below), or are similar or closely related to species from New Guinea or Australia, for example *Clivina fessa*, *Polyderis* cf. *subbrunneus*, *Dicranoncus queenslandicus*, *Batoscelis oblongus*, and *Coleolissus papua*.

Another group of species is part of a subgroup that is restricted to the Wallacea Region, to Sulawesi, the Aru- and Kei Islands, and the Moluccas, for example *Aristolebia timorensis* and related species, *Lebia timorensis* and related species. The concept of Wallacea as a distinct biogeographic region is supported by these species groups.



Figure 23. Summit plateau of Ramelau, collecting site for *Mecyclothorax timorensis*, *M. reidi*, *Rhytisternus externus*.



Figure 24. Edge of Lacluvar. Light trap was placed at edge of playing field overlooking deep gorge between playing field and hill.

A number of species seem to represent endemics of Timor. However, in view of the completely unsatisfactory knowledge of the carabid fauna of surrounding areas, the endemism of some of these species is doubtful. Probably all newly described species may be endemic, likewise the undescribed *Prosopogmus* and *Altagonum*, the three *Anomotarus*, and the three undescribed *Peliocypas*, whereas the status of the unidentified Harpalini, *Colpodes*, and some other species presently cannot be settled.

From this, admittedly, quite restricted evidence we may state that Timor is home to a mixture of carabid genera and species of different provenances and that the island in some ways rather acts as a hinge between the Oriental and Australopapuan faunas. However, the Oriental part of the fauna is more numerous in terms of genera, as well as species. This somewhat contradicts a too strict perception of the various faunal borders that have been drawn through different parts of the Indonesian and Philippine insular belts.

Of the 53 species collected during the expeditions 31 were from lowlands (0–1000 m) (Fig. 24), 28 from moderately high altitudes (1001–2000 m) and 8 from high altitudes (> 2000 m). The focus on relatively upland localities (including several of the ‘lowland’ sites above 700 m) reflected the relative poverty of good habitat in the lowlands exacerbated by the aridity of the lowlands in the dry season. However there was considerable disturbance from grazing from sea-level up to mountain summits. The 12 species identified as endemic were mostly collected from middle and high altitudes (10), with 5 species occurring in lowlands. The 12 identified species which are oriental or widespread in the region were mostly collected in the lowlands (10) with 4 species present at moderate altitude and one species recorded from the summit of Ramelau. It is well known from the New Guinean and eastern Australian carabid faunas, that the species living high on mountain tops and tablelands mostly belong to the ancient Australian fauna, or, in New Guinea, are related to Australian faunal elements, whereas the lowland fauna in both countries is mainly composed of younger, more or less recently immigrant Oriental genera and species (Darlington, 1971; Baehr, 2003b). The Australian Museum survey supports this general observation.

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Appendix. The following species have been described from Timor but were not collected during the Australian Museum expeditions.

Calosoma timorense Chaudoir, 1869: 367 (Timor)
Chlaenius timorensis Darlington, 1970: 344 (Timor)
Cicindela divina Horn, 1893: 200 (Timor)
Cicindela ehlersi Horn, 1914: 31 (Timor)
Cicindela timoriensis Jordan, 1894: 104 (Timor)
Clivina bullata Andrewes, 1927: 270 (Timor)
Collyris viridula Chaudoir, 1865: 503 (Timor)
Dioryche timorensis Schaubberger, 1934: 12 (Timor)
Morion gracilis Jordan, 1894: 107 (Timor)
Paratachys orphnimus Andrewes, 1925: 345 (Timor)
Scarites timorensis Bänninger, 1949: 140 (Timor)
Tachyura triloris Andrewes, 1925: 431 (Timor)

Cestode Parasites (Platyhelminthes) of Rodents from New Guinea and Adjacent Islands with a Redescription of *Paroniella blanchardi* (Parona, 1897) (Davaineidae)

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ABSTRACT. Cestodes collected from a variety of species of rodents of the genera *Chiruromys* Thomas, 1888, *Hydromys* Geoffroy, 1804, *Melomys* Thomas, 1922, *Paramelomys* Rümmler, 1936, *Pogonomys* Milne-Edwards, 1877, *Rattus* Fischer de Waldheim, 1803 and *Uromys* Peters, 1867 from New Guinea and adjacent islands are reported. The species most frequently encountered was the cosmopolitan species *Hymenolepis diminuta* (Rudolphi, 1819) with a single occurrence of the related hymenolepidid *Rodentolepis fraterna* (Stiles, 1906). Davaineid cestodes were common with *Raillietina celebensis* (Janicki, 1902) and *R. melomys* Jones & Anderson, 1996 being found in several host species. *Paroniella blanchardi* (Parona, 1897) is reported and is redescribed together with an apparently novel species of *Paroniella* Fuhrmann, 1920. Two species of *Bertiella* Stiles & Hassall, 1902, *B. anapolytica* Baylis, 1934 and *B. musasabi* Yamaguti, 1942 were encountered considerably extending their known host and geographical ranges. *Mathevotaenia niuguiniensis* Beveridge, 2008, previously reported from New Guinea was found in additional host species. A dilepidid cestode species was also found but the material available was insufficient to allow identification. Numerous new host species are reported for the cestodes described.

KEYWORDS. Cestoda; parasites; Platyhelminthes; rodents; New Guinea

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The island of New Guinea and its adjacent islands are home to a diverse array of rodents (Flannery, 1995a, 1995b; Rowe *et al.*, 2008). The cestode fauna of rodents in New Guinea and its adjacent territories is extremely poorly documented, in spite of the propensity of these rodents to harbour cestodes of zoonotic significance. Both *Hymenolepis diminuta*

(Rudolphi, 1819) and *Rodentolepis nana* (Siebold, 1852) (as *Hymenolepis nana*) have been reported from humans in Papua New Guinea and are considered to be zoonotic (Owen, 2005).

Reports of cestodes from rodents however are limited. Jones & Anderson (1990) reported *H. diminuta* from

Pogonomelomys rueemmleri (Tate & Archbold, 1941), now *Coccymys rueemmleri* (Tate & Archbold, 1941) and from “*Rattus ruber*”, currently a synonym of *Rattus nitidus* (Hodgson, 1845) at the Baiyer River Sanctuary and near Mount Hagen (Fig. 1). Subsequently they (Jones & Anderson, 1996) described *Raillietina melomyos* Jones & Anderson, 1996 from *Melomys rufescens* (Alston, 1877). Smales (2006) reported *H. diminuta* from *Hydromys chrysogaster* Geoffroy, 1804 while Smales & Spratt (2008) reported the same species from *Uromys caudimaculatus* (Krefft, 1867). Beveridge (2008) reported the first species of *Mathevotaenia* Akumyan, 1946, *M. niuguiniensis* Beveridge, 2008, from the region in *Parahydromys asper* (Thomas, 1906) and Smales (2009) reported *Raillietina celebensis* from *Melomys rufescens*. Owen (2011) listed *R. ?celebensis* (Janicki, 1902) from *Rattus exulans* (Peale, 1848) and *Raillietina* sp. from *Rattus leucopus* (Gray, 1867), *H. diminuta* from *R. leucopus* and *R. rattus* (Linnaeus, 1758), *Rodentolepis fraterna* (Stiles, 1906) from *R. exulans* as well as the strobilocercus (larval stage) of the taeniid cestode *Taenia taeniaeformis* (Batsch, 1786) from *Mallomys rothschildi* Thomas, 1898 and *R. rattus*. Smales (2012), in a review of the helminth parasites of rodents belonging to the tribe Hydromyini (formerly the subfamily Hydromyinae), also recorded incompletely identified species of *Bertiella* Stiles & Hassall, 1902 and *Hunkeleria* Spasskii, 1992 in *Lorentzimys nouhuysi* Jentink, 1911. There are additional early descriptions of cestodes such as those of Parona (1897) of a davaineid cestode, *Paroniella blanchardi* (Parona, 1897) from rodents from Seram, but for which the descriptions are extremely poor.

Based on these reports, it is evident that knowledge of the cestode fauna of rodents in New Guinea and its adjacent islands is extremely fragmentary. The present study contributes to a more detailed understanding of the cestode parasites of this region.

Materials and methods

Cestodes were recovered from the digestive tracts of rodents held in the collections of the Australian Museum, Sydney (AM). The fixation history of the rodents is not known but at the time of removal of the cestodes, they were stored in 70% ethanol. Representative cestodes were stained in Celestine blue, dehydrated in ethanol, cleared in methyl salicylate and mounted in Canada balsam. To examine egg structures, gravid segments of a few cestodes were teased apart in Hoyer's medium and for the examination of rostellar hooks, some squash preparations of scoleces were also prepared in Hoyer's medium (Pritchard & Kruse, 1982). Additional portions of strobila of some specimens were embedded in paraffin, sectioned at a thickness of 5–7 µm and stained with haematoxylin and eosin. In descriptions, measurements are given in millimetres as the range followed by the mean in parentheses. All specimens have been deposited in AM and registration numbers (W) cited in the text.

Principal collecting localities are indicated in Fig. 1. For island locations, all collections based on different localities on a single small island were grouped together for simplicity. A single collecting locality, Manggole Island in the Moluccas, is not shown in Fig. 1.

The host taxonomy used in this report follows Lecompte *et al.* (2008), with common names based on Wilson & Reeder (2005).

Results

Cyclophyllidea van Beneden in Braun, 1900

Hymenolepididae Perrier, 1897

***Hymenolepis* Weinland, 1858**

***Hymenolepis cf diminuta* (Rudolphi, 1819)**

Material examined. From *Hydromys chrysogaster* Geoffroy, 1804 (water rat): Mabea Village, Itugli, Fergusson Island, Milne Bay Province, 9°30'S 150°E (W23775); Imalele Village, Bunala River, Fergusson Island, Milne Bay Province, 9°30'S 150°33'E (W23776); from *Rattus elaphinus* Sody, 1941 (Sulu Archipelago rat): Cepalulu Village, Manggole Island, North Moluccas, 1°53'S 125°50'E (W23768); from *Rattus leucopus* (Gray, 1867) (Cape York rat): Jirlai, Kobroor Island, Aru Islands, West Papua, 6°02'S 134°32'E (W48826–827); from *Rattus mordax* (Thomas, 1904) (eastern New Guinea rat): Wamla Village, Normanby Island, Milne Bay Province, 10°30'S 151°17'E (W23787); from *Rattus niobe* (Thomas, 1906) (eastern New Guinea mountain rat): south of Tifalin, West Sepik Province, 5°05'S 141°25'E (W23790); Dokfuma, Star Mountains, West Sepik Province, 5°01'S 141°07'E (W23793); Kamptamen, South of Hindenberg Wall, West Sepik Province, 5°10'S 141°16'E (W23788–789); Ofekaman–Telefonin Area, West Sepik Province, 5°05'S 141°35'E (W23794); from *Rattus tanezumi* Temminck, 1844 (oriental house rat): Piliana Village, Seram, Maluku Province, 3°15'S 129°30'E (W48825); from *Rattus verecundus* (Thomas, 1904) (New Guinea slender rat): Kutubu Lake, Mt Kemenagi, Southern Highlands Province, 6°23'S 143°19'E (W23821); Munimum Village, Agau, Milne Bay Province, 9°53'S 149°23'E (W23822); from *Rattus vandeuseni* Taylor & Calaby, 1982 (Van Deusen's New Guinea mountain rat): Munimum Village, Aguan, Milne Bay Province, 9°53'S 149°23'E (W23816–818).

Remarks. This cosmopolitan species is known from rodents throughout the world (Schmidt, 1986) including New Guinea where it has been found in “*Rattus ruber*” (now a synonym of *Rattus nitidus* (Hodgson, 1845) and *Pogonomelomys rueemmleri* Tate & Archbold, 1941 (see Jones & Anderson, 1990). It has been reported previously from *H. chrysogaster* in Australia (Smales *et al.*, 1990) although not previously in New Guinea or from any species of the other hosts listed above all of which therefore represent new records. The species has been identified as “*cf diminuta*” as recent molecular studies have indicated that it probably constitutes a species complex currently undifferentiable using morphological criteria (Haukisalmi *et al.*, 2010).

***Rodentolepis* Spasskii, 1954**

***Rodentolepis fraterna* (Stiles, 1906)**

Material examined. From *Paramelomys rubex* (Thomas, 1922) (mountain paramelomys): Ofekama, Telefomin, West Sepik Province, 5°08'S 141°38'E (W48772).

Remarks. Only a single specimen of this common parasite of rodents was identified. The nomenclature for the specific name used here follows the principal text in Baer & Tenora (1970), although it appears from footnotes in the paper (p. 27) that the two authors disagreed on its taxonomic status,

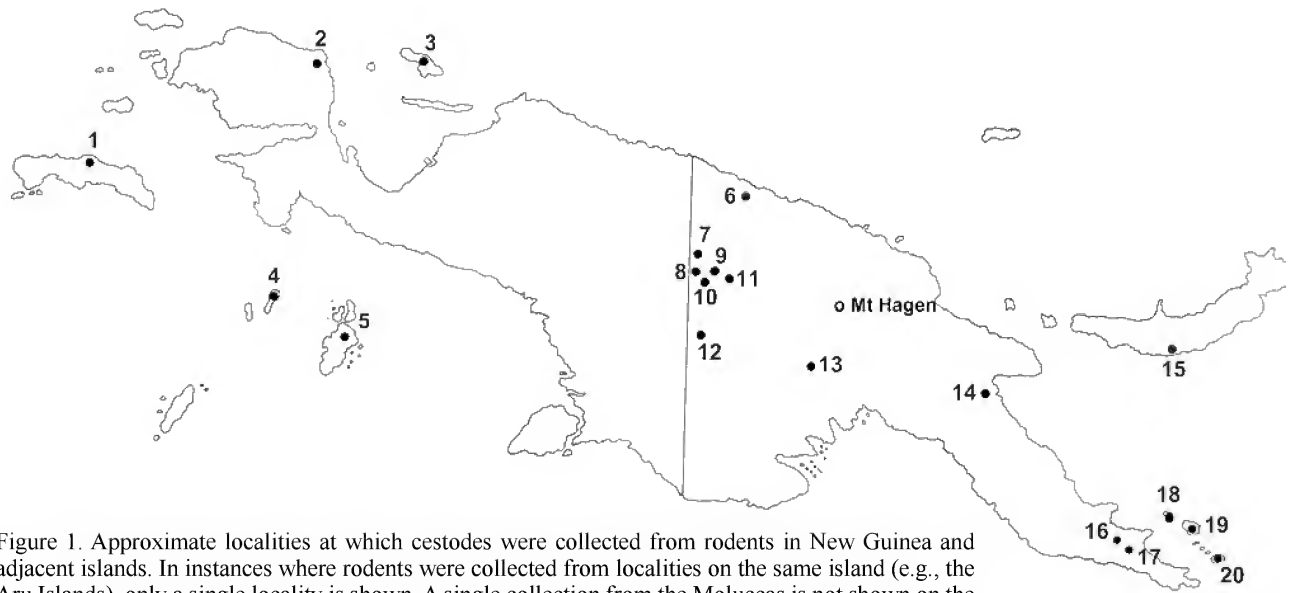


Figure 1. Approximate localities at which cestodes were collected from rodents in New Guinea and adjacent islands. In instances where rodents were collected from localities on the same island (e.g., the Aru Islands), only a single locality is shown. A single collection from the Moluccas is not shown on the current figure. Collection localities are indicated by numerals: 1, Seram; 2, Mokwam; 3, Supiori Island; 4, Kei Basar; 5, Wokan Island, Aru Islands; 6, Mount Somoro; 7, Yapsiei; 8, Star Mountains; 9, Tifalin; 10, Hindenburg Wall; 11, Ofekaman-Telefonin; 12, Ok Tedi; 13, Lake Katubu; 14, Mount Missim; 15, Fulleborn; 16, Aguan; 17, Munimum; 18, Goodenough Island; 19, Fergusson Island; 20, Normanby Island.

Baer preferring *nana*. The same species is frequently reported under the name *Hymenolepis fraterna* (as in Baer & Tenora, 1970) and it may or may not be a synonym of *R. nana*, a common parasite of humans (Haukisalmi *et al.*, 2010). Some evidence exists from experimental and molecular studies that the rodent and human parasites are genetically and biologically distinct (Macnish *et al.*, 2002a,b), but the evidence is not conclusive. *Rodentolepis nana* (as *Hymenolepis nana*) has been reported as a zoonosis in Papua New Guinea (Owen, 2005). *Paramelomys rubex* is a new host for this species of cestode.

Anoplocephalidae Cholodkovsky, 1902

Bertiella Stiles & Hassall, 1902

Bertiella anapolytica Baylis, 1934

Material examined. From *Paramelomys lorentzii* (Jentink, 1908) (Lorentz's paramelomys): Wokam Island, Aru Islands, Western Papua, 6°10'S 134°30'E (W23783).

Remarks. This cestode species has been reported from Sumatra (Baylis, 1934) and from south-eastern Australia (Beveridge, 1985) from species of *Rattus*. The current report is the first from New Guinea and extends the known host range of the species to the genus *Melomys*. The host specimen from which these cestodes were obtained is apparently that referred to by Flannery (1995a), as the only specimen of this host collected on the Aru Islands.

Bertiella musasabi Yamaguti, 1942

Material examined. From *Chiruromys forbesi* Thomas, 1888 (Forbes' chiruromys): Vilivilimana Village, Fergusson Island, Milne Bay Province, 9°24'S 150°26'E (W23779); Yabamakubokubo Village, Fergusson Island, Milne Bay Province, 9°25'S 150°26'E (W23780–781); from *Pogonomys championi* Flannery, 1988 (Champion's pogonomys):

Tifalmin Valley, West Sepik Province, 5°07'S 141°25'E (W23772–774);

Remarks. *Bertiella musasabi* was originally described from *Petaurista leucogenys* (Temminck, 1827) from Japan (Yamaguti, 1942), and was redescribed from *Petaurista petaurista* (Pallas, 1766) from Taiwan by Beveridge (1989). It is also known from India from *P. petaurista* (as *Indotaenia indica* Singh, 1962) (Singh, 1962). The current reports are the first reports of the species from the region and involves additional rodent genera as hosts for this species of cestode.

Mathevotaenia Akhmyan, 1946

Mathevotaenia niuguiniensis Beveridge, 2008

Material examined. From *Pogonomys silvestris* Thomas, 1920 (grey-bellied pogonomys): Mount Biyao, Munimum Village, Aguan, Milne Bay Province, 9°53'S 149°23'E (W23810–812); Kawaya Village, Aguan, Milne Bay Province, 9°53'S 149°22'E (W23813); from *Rattus niobe* (Thomas, 1906) (eastern New Guinea mountain rat): Dokafuma, Star Mountains, West Sepik Province, 5°01'S 141°07'E (W23792–793);

Remarks. This species was originally described from *Parahydromys asper* (Thomas, 1906) from the Southern Highlands Province of Papua New Guinea (Beveridge, 2008), being the only species of the genus known from the region. The current collections substantially increase the known host and geographic range of the cestode.

Davaineidae Braun, 1900

Raillietina Fuhrmann, 1920 *sensu lato*

Many of the rodents examined were parasitised by davaineid cestodes belonging to this genus. However, because of their poor state of preservation and the presence of few entire

specimens, only a small number were identifiable to species. In addition, one species was recognised which does not fit the description of any known species, but the available material is too poor to allow a full description.

Yamaguti (1959), Artykh (1966) and Schmidt (1986) recognised four sub-genera within *Raillietina*, these being *Raillietina sensu stricto*, *Fuhrmannetta* Stiles and Orleman, 1926, *Skrjabinia* Fuhrmann, 1920 and *Paroniella* Fuhrmann, 1920. The most recent review of the family (Jones & Bray, 1994) treats these taxa as independent genera, a practice followed here.

Raillietina* Fuhrmann, 1920 *sensu stricto

***Raillietina celebensis* (Janicki, 1902)**

Material examined. From *Paramelomys rubex* (Thomas, 1922) (mountain paramelomys): Mabiomskin, Ok Tedi, Western Province, 6°06'S 141°17'E (W23802); from *Rattus feliceus* Thomas, 1920 (spiny Seram rat): Piliana Village, Seram, Maluku Province, 3°15'S 129°30'E (W23778); from *Rattus praetor* (Thomas, 1888) (large New Guinea spiny rat): Tawa Ridge, Fulleborn West, New Britain Province, 6°03'S 150°42'E (W23800);

Remarks. This cestode is widely distributed in south-east Asia including Australia and is reported also from Iraq (Sandars, 1956, 1957; Al-Hadithi *et al.*, 1985; Huq *et al.*, 1985; Hasegawa *et al.*, 1994; Xuan *et al.*, 2001). Sandars (1956) summarised the morphological features of the species, but the ranges of measurements for some characters are very broad, leading to the suspicion that the current descriptions may include more than one species. It has previously been reported from New Guinea only as *R. ?celebensis* by Owen (2011) and hosts recorded here represent new host records.

***Raillietina melomyos* Jones & Anderson, 1996**

Material examined. From *Paramelomys rubex* (Thomas, 1922) (mountain paramelomys): Mt Somoro, Torricelli Mountains, West Sepik Province, 3°24'S 142°08'E (W23804); from *Rattus steini* Rümmler, 1935 (Stein's New Guinea rat): Mt Missim, Wau, Morobe Province, 7°17'S 146°46'E (W23809).

Remarks. This species was originally described from *Melomys rufescens* from the Western Highland Province of Papua New Guinea (Jones & Anderson, 1996). The species is readily identifiable by its small rostellar hooks 8–11 µm long and its armed suckers. The cestode species is recorded here from two new host species. Material from a single *M. rufescens* was available in the current collection, but it lacked scoleces.

***Paroniella* Fuhrmann, 1920**

***Paroniella blanchardi* (Parona, 1897)**

Figs. 2–9

Davainea blanchardi Parona, 1897

Brumptiella blanchardi (Parona, 1897), Lopez-Neyra, 1931

Delamurella blanchardi (Parona, 1897), Spasskii & Spasskaya, 1976

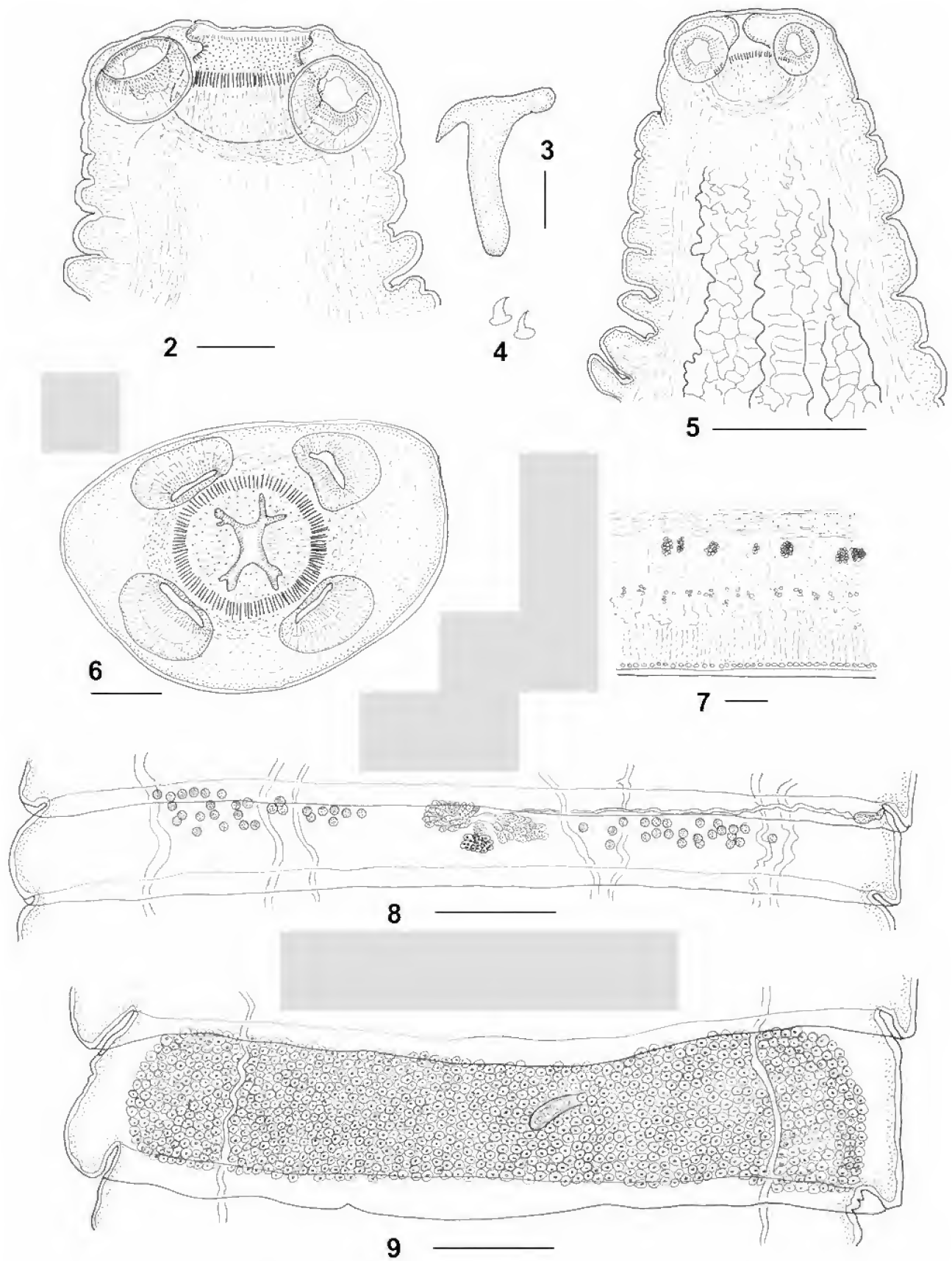
Material examined. From *Paramelomys lorentzii* (Lorentz's paramelomys): Wokan Island, Aru Islands, West Papua,

5°37'S 143°30'E (W48821); from *Rattus feliceus* Thomas, 1920 (spiny Seram Island rat): Piliana Village, Seram, Maluku Province, 3°15'S 129°30'E (W23778).

Description

Large cestodes up to 110 mm long, 5 mm in width; scolex 0.42–0.50 (0.48, n = 5) in diameter; suckers 0.10–0.14 (0.12, n = 5) in diameter, armed with rows of spines; rostellum 0.17–0.24 (0.20, n = 5) in diameter; internal wall of rostellar sac lined with tiny spines; rostellar hooks c. 125 in number, hammer-shaped, arranged in two circles, 0.025–0.035 (0.030, n = 5) long; genital pores essentially unilateral; single block of 4 segments with reversed polarity seen in one section of strobila; mature segments elongated laterally, craspedote, 0.17–0.25 (n = 0.21, n = 5) long, 1.84–3.35 (2.47, n = 5) wide, length: width ratio 12; genital atrium close to anterior margin of segment; cirrus sac small, c. 0.10–0.14 long, 0.05 wide, not reaching osmoregulatory canals; distal cirrus armed (visible only in histological sections); vas deferens, sinuous, running along anterior margin of segment; 18–28 (23, n = 5) and 29–40 (34, n = 5) poral and aporal testes respectively; testes 0.04–0.05 (0.05, n = 5) in diameter. Vagina opens to genital atrium posterior to cirrus sac, wall muscular, internal lining of distal vagina armed (visible only in histological sections); female genital complex in mid-line; ovary bilobed, poral lobe slightly smaller, 0.08–0.13 (0.10) × 0.08–0.13 (0.10) with fewer lobules than aporal lobe, 0.12–0.20 (0.17, n = 5) × 0.08–0.11 (0.10, n = 5); Mehlis' gland posterior to ovarian isthmus, c. 0.04 in diameter; vitellarium lobulate, posterior to Mehlis' gland, 0.07–0.14 (0.11, n = 5) × 0.05–0.06 (0.06, n = 5); vagina slender; seminal receptacle evident in gravid but not in mature segments; gravid segments 0.35–0.60 (0.52, n = 5) long, 2.70–4.10 (3.20, n = 5) wide, length: width ratio, 6.2; with eggs in individual capsules, capsules 0.025–0.040 (0.035, n = 5) in diameter; eggs 0.018–0.025 (0.021, n = 5) in diameter; egg capsules entirely fill gravid segments, extending beyond osmoregulatory canals; osmoregulatory system highly reticulate; largest vessels in gravid segments 0.03 in diameter. Longitudinal musculature composed of two bands of fibres; inner band of larger bundles of up to 20 fibres; 40 bundles on each side of segment; outer band composed of individual fibres or bundles of up to 5 fibres; transverse muscle forming a broad band medial to inner longitudinal muscles; dorsoventral muscles scattered, individual.

Remarks. In possessing unilateral pores and a single egg per egg capsule, this species belongs to the genus *Paroniella*. Sawada (1964) in a comprehensive list of all known species included only a single species of *Paroniella* from rodents, *P. blanchardi* (Parona, 1897) described from *Leopoldamys siporamus* (Thomas, 1895) (as *Mus siporamus*) and *Maxomys rajah* (Thomas, 1894) (as *Mus rajah*) on Sipura Island (as Sipora or Sereinu), part of the Mentawai group of islands off Sumatra (Parona, 1897). No species of *Paroniella* from rodents has been added since Sawada (1964). The description and illustrations by Parona (1897) are limited in detail, but report a maximum length of 75 mm, a width of 5 mm, with about 300 segments, a scolex 0.5 mm in diameter, a rostellum bearing 70–80 hooks 0.032 mm long and sucker spines 0.006 mm long. Most of the principal dimensions provided by Parona (1897) thus match those of the specimens described above, apart from the number of rostellar hooks.



Figures 2–9. *Paroniella blanchardi* (Parona, 1897). (2) scolex, dorsoventral view; (3) rostellar hook; (4) sucker spines; (5) Anterior extremity of strobila showing reticulated osmoregulatory system; (6) scolex, apical view; (7) optical transverse section of hand-cut section showing longitudinal and transverse musculature; (8) mature segment; (9) gravid segment. Scale bars: Figs. 5, 8, 9—1.0 mm; Figs. 2, 6, 7—0.1, mm; Figs. 3, 4, to same scale—0.01 mm.

Counting the number of hooks from lateral views of a scolex and then doubling the number gave a value of 70–80, the number estimated by Parona (1897), while examination of an apical view of the scolex (Fig. 6) suggested a number of about 125 hooks. Parona (1897) provided no details of the mature segment such that comparisons with the data presented here are not possible. He illustrated the lateral region of several gravid segments, which indicate that the genital pores were unilateral. In the fragments available for examination here, genital pores were generally unilateral, but one area of strobila was seen in which a series of four segments in a fragment containing 14 segments, exhibited a reverse polarity. The current re-description, while still incomplete due to the poor nature of the material, increases the known number of host species and is the first report of the species from New Guinea.

The captions to the figures of the original description of this species (p. 124) have November, 1897 as the publication date and in a table of measurements on p. 106, the species is cited as “*D. blanchardi* n. sp. Parona, 1897”. However, the initial page of the issue of the journal gives the publication date as 1898. In spite of this discrepancy, the citation date has not been altered from that used in the literature.

Joyeux & Baer (1927) recorded *P. blanchardi* from *Thryonomys swinderianus* (Temminck, 1827) from Dahomey (Abomey) in Benin and illustrated the scolex and a rostellar hook but provided no description. The same illustrations were used by Artykh (1966) in his summary of the species. Janicki (1906) and Shipley (1908) included the species (as *Davainea blanchardi*) in their lists of cestodes from rodents (*Rattus*) known at that time, but did not provide any additional details.

No other species of *Paroniella* has been reported from rodents apart from a record of *P. retractilis* (Stiles, 1895), described initially as a parasite of lagomorphs in North America, and also from *Rattus rattus* in Benin (Joyeux & Baer, 1927).

Of the various species of *Paroniella* known from New Guinea (Sawada, 1964), *P. conopophilae* (Johnston, 1911), *P. corvina* (Fuhrman, 1905) and *P. paradisiae* (Fuhrmann, 1909) are known from birds (Sawada, 1964, Schmidt, 1986), but are readily distinguishable from *P. blanchardi* using the metrical data provided in Sawada (1964). *Paroniella appendiculata* (Fuhrmann, 1909) was described from an unknown host (Fuhrmann, 1909), but differs from *P. blanchardi* in lacking scolex and sucker spines, in having larger hooks (36–43 µm) and in having characteristically shaped campanulate segments (Fuhrmann, 1909).

Paroniella sp.

Figs. 10–14

Material examined. From *Melomys lutillus* (Thomas, 1913) (Papua grassland melomys): Ohoilin Village, Kei Besar, Maluku Province, 5°36'S 133°03'E (W23784); from *Rattus feliceus* Thomas, 1920 (spiny Seram Island rat): Piliana Village, Seram, Maluku Province, 3°15'S 129°30'E (W23778); from *Rattus mordax* (Thomas, 1904) (eastern New Guinea rat): Kalo-kalo Village, Fergusson Island, Milne Bay Province, 9°25'S 150°26'E (W23786); from *Rattus tanezumi* Temminck, 1844 (oriental house rat): Ohoilin Village, Kei Besar, Maluku Province, 5°36'S 133°3'E (W23815).

Description

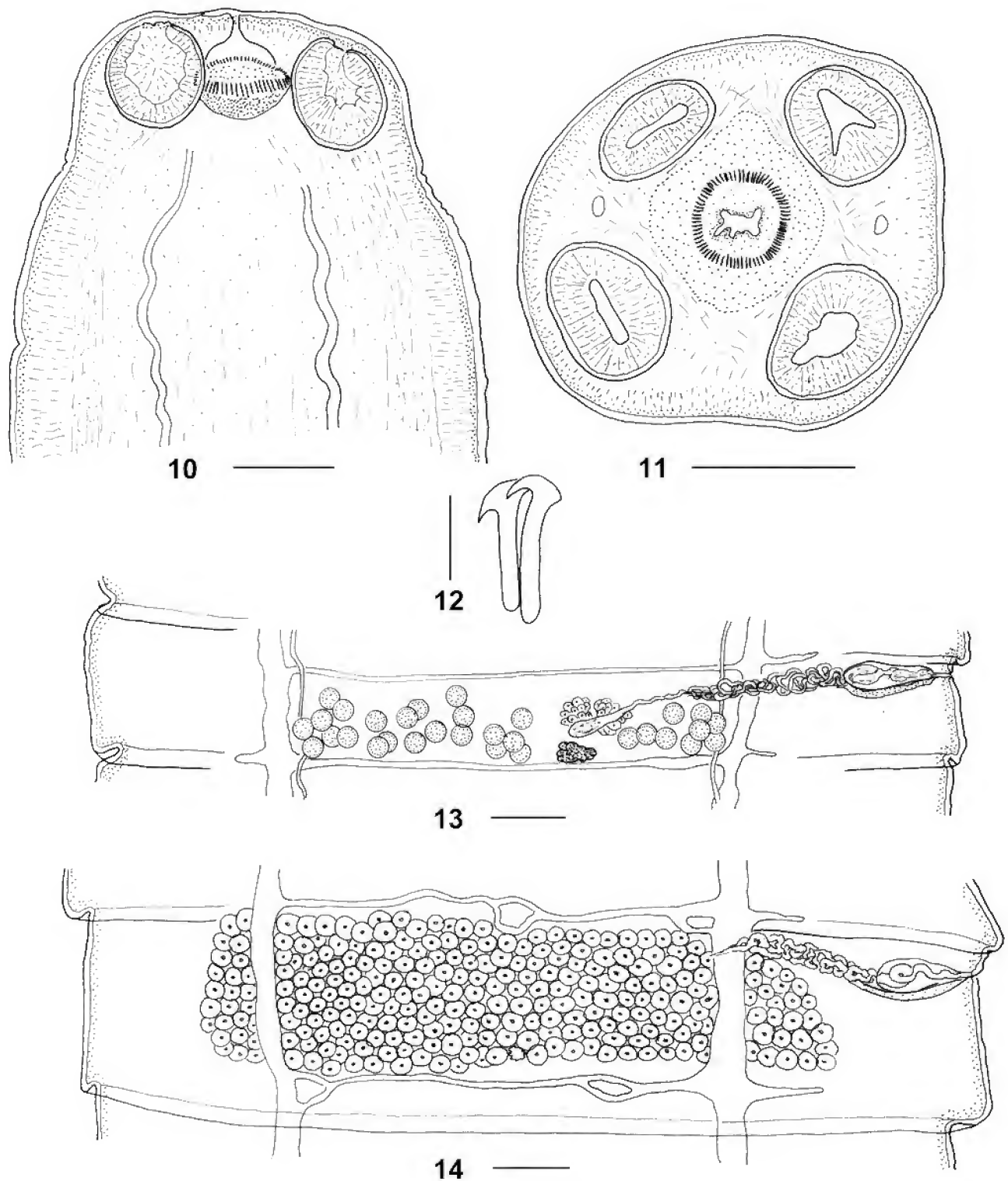
Description based on 4 specimens from *R. feliceus*: small cestodes; scolex 0.30–0.45 (0.36, n = 4) in diameter; retracted rostellum 0.09–0.10 (0.10, n = 3) in diameter; suckers 0.09–0.12 (0.10, n = 6) in diameter, lacking spines; rostellar hooks c. 80 in number; hooks 0.015–0.020 (0.017, n = 5) long; mature segments craspedote, 0.12–0.20 (0.16, n = 5) long, 1.1–1.2 (1.17, n = 7) wide, length: width ratio 7.3; genital pores unilateral; genital atrium close to anterior margin of segment; cirrus sac small, pyriform, 0.10–0.14 (0.12, n = 5) long, 0.04–0.06 (0.05, n = 5) wide, not reaching osmoregulatory canals; seminal vesicles absent; vas deferens coiled runs along anterior margin of segment; c. 10 poral and c. 20 aporal testes respectively, crossing dorsal but not ventral osmoregulatory canals; testes 0.030–0.045 (0.040, n = 5) in diameter. Vagina opens to genital atrium posterior to cirrus sac; distal region of vagina enlarged; seminal receptacle c. 0.05 × 0.02; female genitalia in midline; ovary with poral lobe 0.05–0.11 (0.08, n = 5) × 0.04–0.06 (0.05, n = 5), slightly larger than aporal lobe, 0.04–0.08 (0.05) × 0.03–0.06 (0.05); vitellarium reniform, posterior to ovary, 0.06–0.10 (0.07, n = 5) × 0.04–0.06 (0.05, n = 5); Mehlis' gland not seen. Gravid segments 0.25–0.30 (0.28, n = 3) long, 1.0–1.6 (1.3, n = 3) wide, length: width ratio 4.6; eggs in individual capsules; egg capsules 0.030–0.050 (0.035, n = 5) in diameter, eggs 0.015–0.025 (0.019, n = 5) in diameter; egg capsules extend beyond osmoregulatory canals; on both sides of segment; osmoregulatory canals paired; ventral canal external, 0.025–0.03 (0.028, n = 3) in diameter; dorsal canal internal to ventral canal, narrower, c. 0.01 in diameter, more sinuous; narrow transverse canal, 0.010–0.015 (0.012, n = 3) in diameter connects ventral canals at posterior margin of each segment; in many segments, lateral extension of transverse canal present, of variable size.

Remarks. These cestodes belong within *Paroniella*, but have smaller rostellar hooks than *P. blanchardi*. As there are no other species of this genus known to be parasitic in rodents (Sawada, 1964), it is assumed that it represents an undescribed species or possibly even more than one species. Unfortunately, the current material is inadequate to allow a full formal description and for this reason the species has not been named. The description has been restricted to specimens from a single host species as some variation in testis number and distribution was noted in material from other hosts.

Raillietina sensu lato

Specimens clearly identifiable as belonging to the *Raillietina* group of genera but not further identifiable are listed below.

Material examined. From *Melomys lutillus* (Thomas, 1913) (Papua grassland melomys): Mokwam area, Arfak Mountains, West Papua, 1°06'S 133°56'E (W23785); from *Melomys rufescens* (Alston, 1877) (black-tailed melomys): Yapsiei Area, West Sepik Province, 4°35'S 141°05'E (W23808); from *Paramelomys rubex* (Thomas, 1922) (mountain paramelomys): Ofektama, Telefomin, West Sepik Province, 5°08'S 141°38'E (W48824); Mokwam area, Arfak Mountains, West Papua, 1°06'S 133°56'E (W23805–806); Mount Somoro, Torricelli Mountains, West Sepik Province, 3°24'S 142°08'E (W23803); from *Paramelomys platyops* (Thomas, 1906) (common lowland paramelomys): Tibib



Figures 10–14. *Paroniella* sp. (10) scolex, dorsoventral view; (11) scolex, apical view; (12) rostellar hooks; (13) mature segment; (14) gravid segment. Scale bars: Figs. 10, 11, 13, 14—0.1 mm; Fig. 12—0.01 mm.

Village, Skonga River, Yapsiei area, West Sepik Province, 4°35'S 141°10'E (W23798); Kampong Korido, Supiori Island, West Papua, 0°50'S 135°36'E (W23799); Boulder camp, Goodenough Island, Milne Bay Province, 9°20'S 150°16'E (W23766); from *Rattus steini* Rümmler, 1935 (Stein's New Guinea rat): Mt Missim, near Wau, Morobe Province, 7°17'S 146°46'E (W23809); from *Uromys*

caudimaculatus (Krefft, 1867) (giant white-tailed uromys): Kokogadi Village, Fergusson Island, Milne Bay Province, 9°30'S 150°34'E (W23770).

Remarks. Most of the specimens of *Raillietina sensu lato* could not be identified to a genus, either because of extremely poor preservation, because scoleces were lacking

Table 1. Cestodes of rodents from New Guinea and adjacent islands reported in this study. Host classification follows Lecompte *et al.* (2008).

Host	Parasite
Subfamily Murinae	
Tribe Hydromyini	
<i>Hydromys</i> division	
<i>Hydromys</i> Geoffroy, 1804	
<i>Hydromys chrysogaster</i> Geoffroy, 1804	<i>Hymenolepis</i> cf. <i>diminuta</i>
<i>Pogonomys</i> division	
<i>Chiruromys</i> Thomas, 1888	
<i>Chiruromys forbesi</i> Thomas, 1888	<i>Bertiella musasabi</i>
<i>Pogonomys</i> Milne-Edwards, 1877	
<i>Pogonomys championi</i> Flannery, 1988	<i>Bertiella musasabi</i>
<i>Pogonomys silvestris</i> Thomas, 1920	<i>Mathevotaenia niuguiniensis</i>
<i>Uromys</i> division	
<i>Melomys</i> Thomas, 1922	
<i>Melomys lutillus</i> (Thomas, 1913)	<i>Paroniella</i> sp.
	<i>Raillietina</i> sp. <i>sensu lato</i>
<i>Melomys rufescens</i> (Alston, 1877)	<i>Raillietina</i> sp. <i>sensu lato</i>
<i>Paramelomys</i> Rümmler, 1936	
<i>Paramelomys lorentzi</i> (Jentink, 1908)	<i>Bertiella anapolytica</i>
	<i>Paroniella blanchardi</i>
<i>Paramelomys platyops</i> (Thomas, 1906)	<i>Raillietina</i> sp. <i>sensu lato</i>
<i>Paramelomys rubex</i> (Thomas, 1922)	<i>Rodentolepis fraterna</i>
	<i>Raillietina celebensis</i>
	<i>Raillietina melomyos</i>
	<i>Raillietina</i> sp. <i>sensu lato</i>
<i>Uromys</i> Peters, 1867	
<i>Uromys caudimaculatus</i> (Krefft, 1867)	<i>Raillietina</i> sp. <i>sensu lato</i>
Tribe Rattini	
<i>Rattus</i> division	
<i>Rattus</i> Fischer de Waldheim, 1803	
<i>Rattus elaphinus</i> Sody, 1941	<i>Hymenolepis</i> cf. <i>diminuta</i>
<i>Rattus feliceus</i> Thomas, 1920	<i>Raillietina celebensis</i>
	<i>Paroniella blanchardi</i>
	<i>Paroniella</i> sp.
<i>Rattus leucopus</i> (Gray, 1867)	<i>Hymenolepis</i> cf. <i>diminuta</i>
<i>Rattus mordax</i> (Thomas, 1904)	<i>Hymenolepis</i> cf. <i>diminuta</i>
	<i>Paroniella</i> sp.
<i>Rattus niobe</i> (Thomas, 1906)	<i>Hymenolepis</i> cf. <i>diminuta</i>
	<i>Mathevotaenia niuguiniensis</i>
	Dilepididae ?genus
<i>Rattus praetor</i> (Thomas, 1888)	<i>Raillietina celebensis</i>
<i>Rattus steini</i> Rümmler, 1935	<i>Raillietina melomyos</i>
	<i>Raillietina</i> sp. <i>sensu lato</i>
<i>Rattus tanezumi</i> Temminck, 1844	<i>Hymenolepis</i> cf. <i>diminuta</i>
	<i>Paroniella</i> sp.
<i>Rattus verecundus</i> (Thomas, 1904)	<i>Hymenolepis</i> cf. <i>diminuta</i>
<i>Rattus vandeuseni</i> Taylor & Calaby, 1982	<i>Hymenolepis</i> cf. <i>diminuta</i>

or because specimens were fragmented. As several instances of mixed infections were encountered, care was taken not to inadvertently associate a scolex of one species with the strobila of another. The data presented here do however suggest the presence of a relatively rich cestode fauna in rodents in New Guinea and careful preservation of future specimens collected should allow the description of new species.

Dilepididae Railliet & Henry, 1909

Material examined. From: *Rattus niobe* Thomas, 1906 (eastern New Guinea mountain rat): Ofekaman–Telefonin Area, West Sepik Province, 5°05'S 141°35'E (W48813); S of Tifalin, West Sepik Province, 5°07'S 141°25'E (W48816); hill south of Tifalmin, West Sepik Province, 5°07'S 141°25'E (W48818, W23795).

Description

Cestodes with an eversible rostellum bearing two circles of 32 hooks; anterior hooks 35 µm long, posterior row 45 µm long; rostellar sac 0.22 mm long. Mature proglottides craspedote, c. 20 testes anterior to female genital complex; eggs in individual capsules; no other features discernible.

Remarks. Due to the lack of morphological features visible in whole mounts, these cestodes could not be identified to generic level. They are recorded here as the specimens may be of use in further studies of the cestodes of rodents from New Guinea.

Discussion

In spite of the generally poor state of preservation of the collection of cestodes reported here, it provides novel insights into the diversity of cestodes in rodents in the region of New Guinea, with numerous new host and geographic records as well as the recognition of potentially new species.

The cosmopolitan species *H. diminuta* was the cestode species most commonly encountered. This result was unsurprising as the species has been recorded from over 80 species of host, primarily rodents, throughout the world (Gibson *et al.*, 2005), including from humans in Papua New Guinea (Owen, 2005). Nevertheless, the current study significantly extends its host range and provides some information on potential sources of infections for humans in New Guinea.

Rodentolepis fraterna, another potentially zoonotic cestode (see above), was found in a single host only.

Two species of *Bertiella* are reported for the first time from New Guinea, although one, *B. musasabi*, is known from countries to the north (Japan, India, Taiwan) and the second, *B. anapolytica* is known from Indonesia and Australia. The majority of species of *Bertiella* occur in arboreal mammals (marsupials, primates, dermopterans, arboreal rodents) and the finding of *B. musasabi* in species of tree-mice (*Chiruromys* and *Pogonomys*) is consistent with this general pattern. *Bertiella anapolytica* appears to be an exception, being found in terrestrial rodents (*Rattus* spp.) in Australia and Indonesia. Of the new host reported here, *Paramelomys lorentzi*, little is apparently known concerning its biology (Flannery, 1995b).

The linstowiid cestode *Mathevotaenia niuguiniensis* was first reported from *Parahydromys asper* by Beveridge (2008). Current records greatly expand its host range in New Guinea. Species of this genus are common in rodents in Africa, Europe, North America and central Asia, but are not known from rodents in south-east Asia (Beveridge, 2008). The genus occurs in bats in southeast Asian and Australia and is common in marsupials in South America, but with only a single species in Australasian marsupials (Beveridge, 2008). As a consequence, additional records of this genus in rodents in New Guinea provide useful additions to its present enigmatic host and geographical distribution.

Two species of the davaineid genus *Raillietina* were encountered. *Raillietina celebensis* has a widespread distribution including southeast Asia and Australia. The probable occurrence of this species in New Guinea was reported by Owen (2011) and therefore was not unexpected. This species may be zoonotic (Sandars, 1956), but has not

been reported as a zoonosis in Papua New Guinea (Owen, 2005). By contrast, *R. melomyos* appears to be endemic to New Guinea, but not, as the specific name suggests, restricted to the rodent section Uromyini, as it has now been found in a species of *Rattus*.

The finding of *P. blanchardi* is the second report of the species since its original description in 1897 and additional morphological details have been added. It was first described from rodents on a small island off the west coast of Sumatra, and the new records, from Seram and the Aru Islands in the Maluku area of the Banda Sea are not far removed from the type locality. Although additional data have been provided on the morphology of this species, its description remains incomplete.

Additional undescribed species of *Paroniella* are clearly present, but cannot be named based on the limited material currently available.

Study of the species of *Raillietina sensu lato*, was clearly restricted by the poor state of preservation of specimens in this collection. However, the data presented here should provide insights into a more detailed exploration of the cestode fauna of rodents in New Guinea based on newer collections.

Overall, in spite of the limitations of poorly preserved specimens, the current reports indicate a diverse cestode fauna in the New Guinea which clearly warrants more detailed investigation.

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